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COMMUNICATIONS & TECHNOLOGY
APRIL 2001

Solar Flip-Flop

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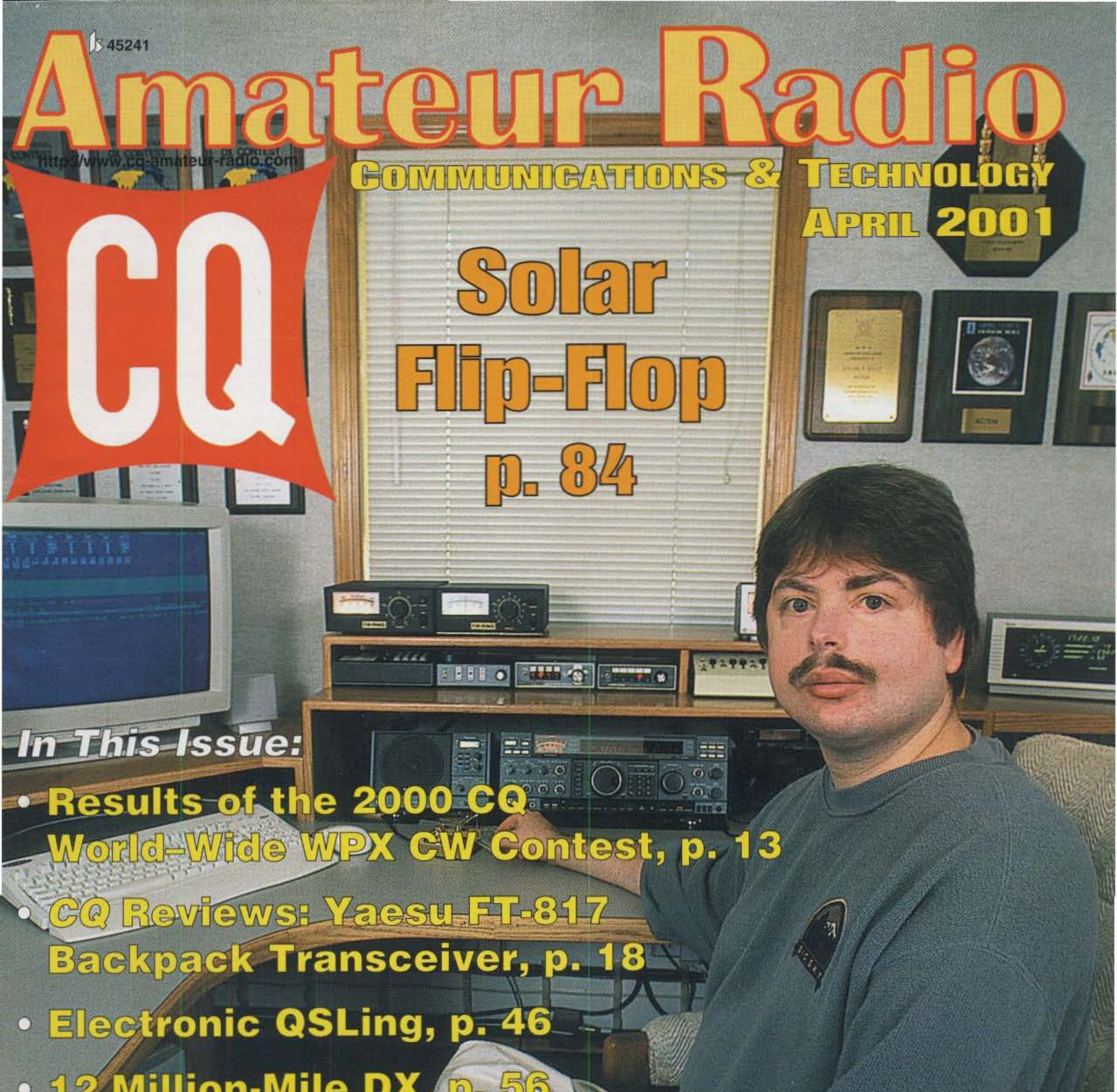

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Kelly, K7EM, of Beavercreek
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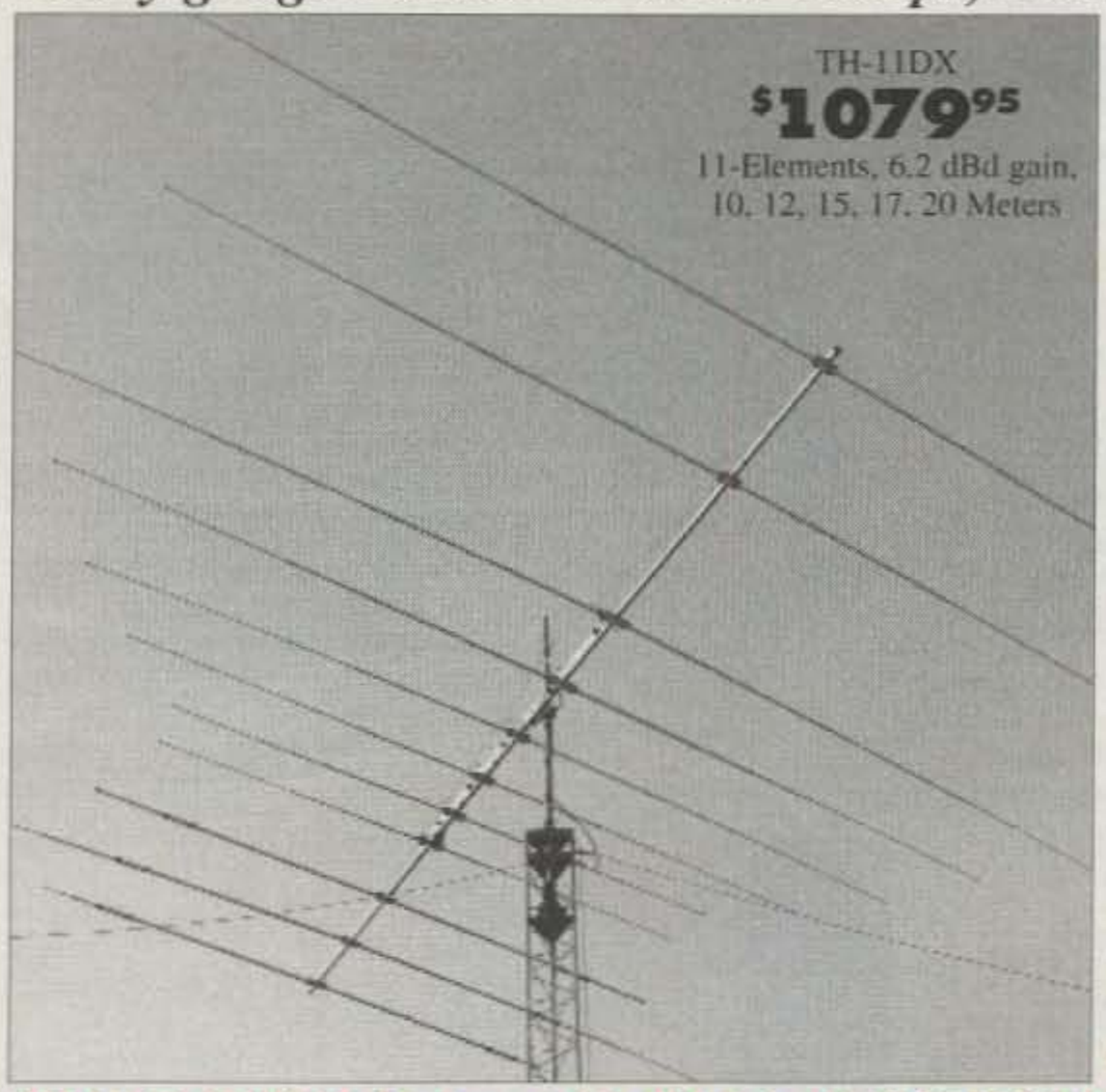

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TH-5MK2, $699.95. 5-element, 6.1 dBd Gain, 10,15,20 Meters

The broadband *five element* TH5-MK2 gives you an outstanding 6.1 dBd average gain.

Separate air dielectric *Hy-Q* traps let you adjust for maximum F/B ratio on each band.

Also standard is *Hy-Gain's* exclusive *BetaMATCH*™, stainless steel hardware and compression clamps and BN-86 balun.

TH-3MK4, $439.95. 3-element, 5.9 dBd Gain, 10,15,20 Meters

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You get an impressive 5.9 dBd average gain and a whopping 25 dB average front-to-back ratio. Handles a full 1500 Watts PEP. 95 MPH wind survival.

Fits on average size lot with room to spare -- turning radius is just 15.3 feet. Four piece boom is ideal for DXpeditions. Rotates with CD-45II or HAM-IV rotator.

Features *Hy-Gain BetaMatch*™ for DC ground, full power *Hy-Q*™ traps, rugged boom-to-mast bracket and mounts on standard 2"O.D. mast. Stainless steel hardware. BN-86 balun recommended.

TH-2MK3, $339.95. 2-element, 3.4 dBd Gain, 10,15,20 Meters

The 2-element TH-2MK3 is Hy-Gain's *most economical* full power (1.5kW PEP) full size tri-bander.

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EXP-14, $549.95. 4-element, 5.9 dBd Gain, 10,15,20 Meters

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BetaMATCH™ provides DC ground to eliminate static. Includes BN-86 balun. Easily assembled.

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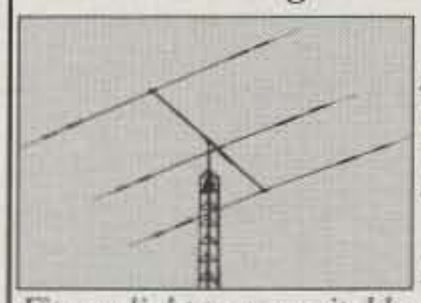

Fits on light tower, suitable guyed TV pole, roof tri-pod

TH-3JRS, $329.95. Hy-Gain's *most popular* 3-element 10, 15, 20 Meter tri-bander fits on most lots! Same top performance as the full power TH3MK4 in a compact 600 watt PEP design.

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TH-11DX	11	6.2	22	4000	10,12,15,17,20	12.5	100	24	37	22	88	1.9-2.5	T2X	$1079.95
TH-7DX	**7**	**6.57**	**21**	**1500**	**10, 15, 20**	**9.4**	**100**	**24**	**31**	**20**	**75**	**1.5-2.5**	**HAM-IV**	**$819.95**
TH-5MK2	5	6.1	20	1500	10, 15, 20	7.4	100	19	31.5	18.42	57	1.5-2.5	HAM-IV	$699.95
TH-3MK4	**3**	**5.8**	**25**	**1500**	**10, 15, 20**	**4.6**	**95**	**14**	**27.42**	**15.33**	**35**	**1.9-2.5**	**CD-45II**	**$439.95**
TH-3JRS	3	5.8	25	600	10, 15, 20	3.35	80	12	27.25	14.75	21	1.25-2.0	CD-45II	$329.95
TH-2MK3	**2**	**3.4**	**15-20**	**1500**	**10, 15, 20**	**3.25**	**80**	**6**	**27.3**	**14.25**	**20**	**1.9-2.5**	**CD-45II**	**$339.95**
EXP-14	4	5.9	25	1500	10,15,20 (QK-710 for 30/40)	7.5	100	14	31.5	17.25	45	1.9-2.5	HAM IV	$549.95

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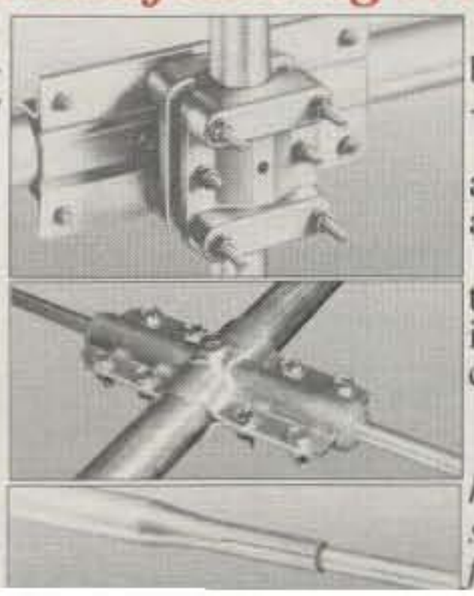

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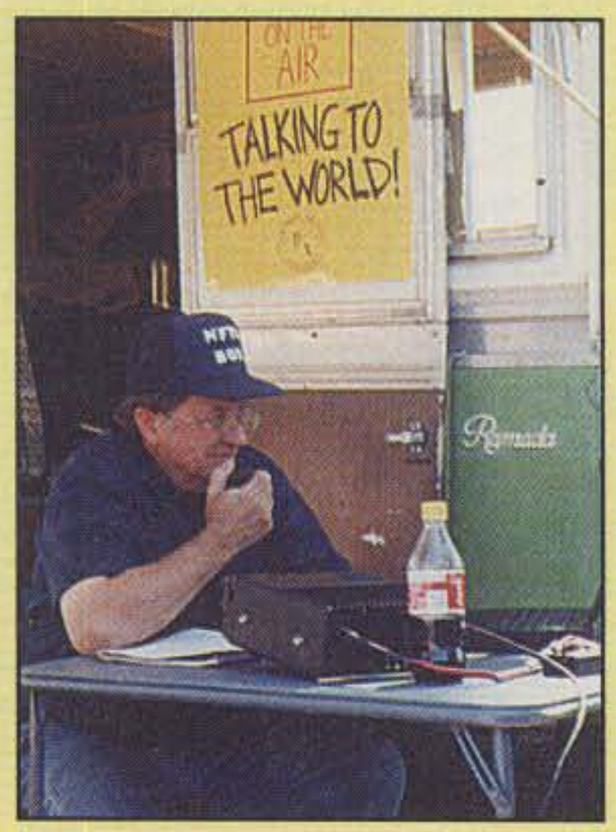

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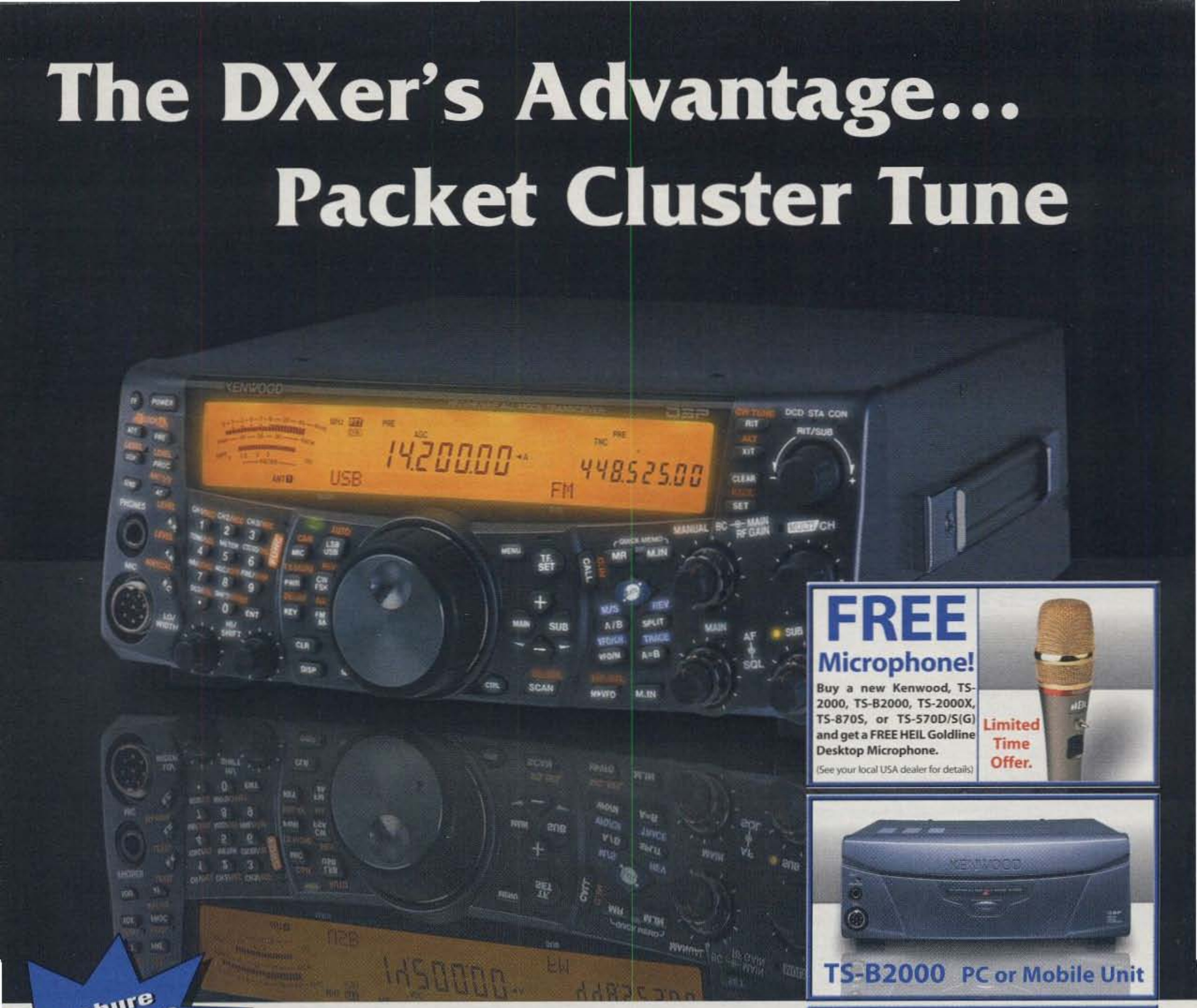
The DXer's Advantage... Packet Cluster Tune



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Ham Radio News

From The CQ Newsroom

Solar Flip Signals Shift of Cycle

Scientists are reporting that the sun's magnetic field has reversed itself, a sure sign that the current sunspot cycle is at its peak and that the long downward slope of Cycle 23 will soon begin. However, peak conditions can be expected to continue for at least several months.

"This always happens around the time of solar maximum," according to David Hathaway, a solar physicist at the Marshall Space Flight Center, quoted by NASA's Science News. "The magnetic poles exchange places at the peak of the sunspot cycle. In fact, it's a good indication that Solar Max is really here."

For more infon on the magnetic field reversal, see N6CL's "VHF-Plus" column in this issue (p. 84) or visit the NASA Science News website <http://science.nasa.gov/headlines/y2001/ast15feb_1.htm>.

Transatlantic Success at 136 kHz

The Radio Amateurs of Canada (RAC) reports that the first successful transatlantic contact on 136 kHz was completed on February 19 between Laurence Mayhead, G3AQC, in England, and Larry Kayser, VA3LK, in Ontario, Canada.

Because of the narrow bandwidth and other factors, the QSO took *two weeks* to complete! According to RAC, the QSO was made using a visual adaptation of Morse code, and using a visual signal-receiving program. The dits were 90 seconds long, the dashes 180 seconds long. Both stations used homebrew transmitters and a mix of commercial and homebrew receiving equipment. For more information about amateur radio on LF, visit the RAC website at <http://www.rac.ca/infodx.htm>.

CQ congratulates both G3AQC and VA3LK on this accomplishment.

Hiker-to-Hiker Record?

Another sort of transoceanic record is being claimed by two hams in California and New Zealand. Bonnie Crystal, KQ6XA, says she and Max Pompe, ZL1BK, have completed the longest-ever "pedestrian-to-pedestrian" radio contact without the use of satellites. They made contact February 18 (UTC) on 10 meter SSB while both were hiking with portable gear overlooking opposite sides of the Pacific Ocean. Crystal estimates the distance between them as approximately 6500 miles. The contact highlights a new subactivity in ham radio called "HF-Packing," involving HF DXing while using backpack-carried equipment while hiking, cycling, or camping. The growing availability of such equipment (such as the Yaesu FT-817, reviewed in this issue on p. 18) should lead to greater popularity for HF-Packing. For more info, see Bonnie's webpage at: <http://www.qsl.net/kq6xa>.

FCC Puts Repeater Issues Front-and-Center

A variety of repeater-related issues rose to the top of FCC Amateur enforcement chief Riley Hollingsworth's desk in late January and early February.

David Kunz, N6WTC, of California, was cited for allegedly transmitting music over a half-hour period via multiple repeater systems in the San Francisco area. According to the FCC, the music was heard on four different frequencies on three ham bands. Hollingsworth also sent letters to the trustees of three affected repeaters, asking why it appeared that no control operator was present to stop the illegal transmissions. The trustees were asked to supply a considerable amount of specific information about control operators, linking, remote control, and other matters.

In Connecticut, the trustee of the N1ABL repeater received a similar letter from Hollingsworth, based on monitoring information indicating that "(e)mergency calls were made to the repeater as well as a specific request to the control operator, but there was no response."

Two hams in New Jersey have been asked for similar information, but with a couple of unusual twists. It seems that both are operating repeaters on the same frequency in the same area; that neither repeater seems to have a controller; that both are interfering with a coordinated repeater; and that, according to the FCC, each system "appears to be used at least partially for trucking company business."

In other repeater-related matters, the FCC says a repeater owner may bar a specific amateur from using a system and that the Commission expects compliance with those requests. Also, a repeater trustee in Colorado is being taken to task by the FCC for reportedly taking no action to resolve an apparent intermod problem that is resulting in the transmission of voice and digital paging signals on its output.

Jail Time, Other Sanctions, For Persistent Violators

A federal judge has sentenced Richard Burton, ex-WB6JAC, to three months in jail plus one year's probation with psychological treatment, for unlicensed operation, according to FCC amateur enforcement chief Riley Hollingsworth, K4ZDH. This is not the first time Burton has been imprisoned for continued unlicensed operation on ham bands.

Jeffrey Pipenur, WA8IKW, is another ham who seemingly can't stay out of trouble. In 1999 the FCC limited him to a one-year license renewal due to interference complaints. During that short-term renewal period, the FCC says, Pipenur continued interfering with hams on 75 meters. He has now agreed to a license restriction that prohibits him from operating below 30 MHz, except for the 30 meter band, for the next three years, rather than face license revocation proceedings. Hollingsworth warned him that any violations of the agreement or of FCC rules will result in revocation action.

Another ham who was in trouble is now back in the FCC's good graces. James Dale, KE4TEW, finished a short-term renewal period with no additional problems and will have his license renewed for a full 10-year term. However, Hollingsworth reminded him in a letter that "Amateur Radio communications travel throughout the world, and the best way to ensure its viability as the world's 'fail-safe' radio service is to operate as if the entire world is listening. It is."

Family of W6SAI Thanks Hams

The family of the late Bill Orr, W6SAI (see obit in "Zero Bias" and additional remembrances in "Propagation"), has written an open letter of thanks to the amateur community for condolences received after Orr's passing on January 24. According to the *ARRL Letter,* the family letter read, in part:

"The entire Orr family wishes to express our deep gratitude for all of your kind condolences upon the death of our father William I. Orr, W6SAI. We have received e-mails from all over the world, and are proud that our father's legacy will live on through people like you, his treasured Amateur Radio family ... It is of great comfort to us to know that you will miss him too. He was our hero and will be forever missed." According to the *Letter,* the Orr family asked that donations in Bill's memory be made to The ARRL Foundation.

Additional and updated news is available on the Ham Radio News page of the CQ website at <http://www.cq-amateur-radio.com>. For breaking news stories, plus info on additional items of interest, sign up for CQ's free online newsletter service. Just click on "CQ Newsletter" on the home page of our website.

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Time marches on and your friends at Kenwood continue to build outstanding products with unparalleled performance and great value. It's not too late to own an "HF Legend," because we are still building them today.

TS-2000 Multi Band/Multi Mode IF DSP

TS-870S 100% Digital IF DSP

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Zero Bias

BY RICH MOSESON, W2VU

An Editorial

Meeting The Challenge

No sooner had last month's issue of *CQ* gone to the printer than we received the sad news that yet another ham radio legend, and another member of the *CQ* "family," had become a Silent Key. Bill Orr, W6SAI, was a friend, a longtime columnist for *CQ* and *Ham Radio* magazines, and author of countless radio-related articles and books. It was somewhat ironic, considering that my March editorial was about the fact that we are slowly losing the generation that pioneered electronic communication, and W6SAI was a giant among them.

Bill was first licensed in 1934 as W2HCE. He started out on 160 meters, then discovered DX on 20 and received an early "WAC Phone" award for making voice contacts with all continents, a much more difficult task in the 1930s than it is today. In 1938 Bill moved to California, where he received W6SAI, the callsign he retained for the rest of his life. During World War II, Bill worked in Douglas Aircraft's Radio Test Department. After the war he worked briefly for the Missile Division of Hughes Aircraft before joining vacuum-tube manufacturer Eitel-McCullogh (Eimac), where he worked for 28 years until his retirement.

On the ham bands, Bill reactivated his station as quickly as possible after wartime restrictions were lifted, and in short order earned ARRL DXCC Award #17 and CQ WAZ (Worked All Zones) Award #4. He was part of the original Project OSCAR team responsible for designing, building, and launching the first ham radio satellite, OSCAR-1. Bill was also part of the first-ever 1296 MHz Earth-Moon-Earth contact between W6HB (the Eimac Radio Club) and W1FZJ (the Rhododendron Swamp Radio Society). In recent years, Bill's favorite bands were 18 and 24 MHz, plus 1296, which he called "the undiscovered band," a favorite ever since that historic EME contact.

As a writer, Bill had few if any equals in the ham radio world. His articles and books were always well-written, accurate, informative, and entertaining. He had a knack for explaining technical matters in plain English that made his writing particularly attractive to newcomers. In fact, his most recent *CQ* column, "Radio FUNdamentals," which he wrote from 1990–1998, was focused on new hams. Another of Bill's favorite topics was antennas. He wrote *CQ*'s antennas column from 1973–1980, and wrote three books on antennas (some co-authored with longtime friend Stu Cowan, W2LX): the *Beam Antenna Handbook*, *All About Cubical Quads*, and *The W6SAI HF Antenna Handbook*, in addition to his and Stu's classic *Radio Handbook*.

I had the privilege of working closely with Bill back in 1994, when we were preparing the 50th Anniversay issue of *CQ*. He and Joe Lynch, N6CL, were teamed up to write the history of ham radio from 1945 to 1995, with Bill taking the three earlier decades and Joe taking the two more recent ones. Bill also wrote with great relish about the pre-history of *CQ*, starting with *Pacific Radio News* in 1917, which went through a variety of changes in name and ownership before becoming the foundation from which *CQ* was launched in 1945. Working with Bill was a tremendous pleasure, and we continued to stay in touch. His love for radio history was tangible, perhaps because he was so much a part of it himself. And ham radio always played a central role in Bill's life. He was 81 when he passed away on January 24 at his home in Menlo Park, California. Bill's friend and colleague, George Jacobs, W3ASK, has additional reminiscences, especially of their work together on OSCAR-1, in his propagation column on page 99.

The ham radio history that Bill wrote with N6CL is the only recorded history of our hobby in the post World War II era. His passing makes it even more urgent for as many of you as possible to add your recollections to the *CQ* Oral History Proect I described in this space last month. I encourage you to do so; if you don't have web access to post your recollections on our website, send them to us in the mail and we'll post them for you. It would be wonderful to be able to use all of your contributions to assemble a first-person history of radio's first century.

Looking for Challenges

Bill Orr shared a trait with many hams—the love of a challenge, and of meeting and beating the challenge. Private citizens orbiting a satellite? In 1961? Unthinkable. Bill was there to help make it happen. Bounce signals off the moon on "useless" microwave frequencies? Ridiculous. Bill was there to help make it happen. New HF bands to bring to life on 12 and 17 meters? Bill was there to help make it happen. But Bill was not alone in any of these pursuits. Seeking out challenges has always been part of the ham radio personality, whether through DXing and trying to work those rare countries; contesting and trying to beat yourself as well as your fellow hams; building radios; writing software; etc.

Hams love challenges. We wouldn't be hams if we didn't. Why use the radio to talk with people when you can much more easily make a phone call or send an e-mail to virtually any point on the globe? Why bother getting or upgrading your license (even if you think it's less of a challenge than in years past)? Why struggle to figure out a way to get on the air from a location with antenna restrictions? There's only one answer: We love the challenge. And more important, we love beating the challenge, whether it's getting through to some exotic location or just getting on the air.

Two of the most popular challenges in ham radio today are operating QRP (low-power) and/or operating via Morse code. If you're a QRP enthusiast, or if you like to operate while hiking or biking or traveling around the country, you won't want to miss our review of Yaesu's (oops, Vertex Standard's) new hand-carried FT-817 transceiver, with up to 5 watts out on HF, VHF, and UHF. While it was designed primarily as a QRP/backpacking rig, both reviewer N7RR and Yaesu's Chip Margelli, K7JA, say hams are finding all sorts of additional uses for this radio. It will be very interesting to see where this radio leads our hobby, just as ICOM's IC-706 knocked down the hardware barriers between HF and VHF/UHF several years ago and Kenwood's inclusion of digital features such as APRS and packet clusters in HTs, FM mobile rigs, and now base units (the TS-2000) is leading us toward a blurring of distinctions between analog and digital communications. It seems that each of the three major ham manufacturers has a slightly different vision and focus for the future, which is good for ham radio, because it assures a place in that future for each of them and a growing variety of choices for active hams. Add to this the additional innovations regularly brought to the marketplace by smaller manufacturers

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and the again-growing number of hams who like to experiment and develop new things (there's that challenge again), and I am very optimistic about our future.

A major part of our past is also an important part of our future. As I'm writing this, it's been less than a month since the ARRL Board of Directors decided to accept the reality that the International Telecommunications Union will almost definitely eliminate the international requirement for Morse code testing as a condition of HF amateur licensing at the next World Radicommunication Conference in 2003. So the avalanche of letters decrying the ARRL for "selling out" ham radio (despite its strong urging that the FCC maintain a domestic code requirement even if there's no international rule) has not yet begun. But the truth is this: CW will remain popular as long as people enjoy using it. Plain and simple.

Code tests and licensing requirements have never "made" CW enthusiasts. Lots of hams have passed even a 20 wpm code test but rarely use CW, simply because they don't really enjoy it. On the other hand, lots of other hams *love* CW—they enjoy its challenges—and will continue to love CW whether or not the ITU or the FCC requires people to pass code tests in order to get or upgrade their ham licenses. Their love for CW generally is not rooted in the fact that they were required to learn it at a certain speed. In fact, lowering the test speeds may encourage more people to get on the CW subbands now that operating code is seen more as a challenge than as a roadblock.

Those who find they enjoy it will also find that their speed increases, their proficiency increases, and their love of CW as an operating mode increases. They'll also find themselves working DX stations that can't be reached on phone, getting through on bands where phone just isn't making it that day, and enjoying success with challenging modes such as EME (moonbounce) and QRP. As long as there are people who enjoy CW, the CW subbands will be safe and CW will be safe as an operating mode. Plain and simple. To paraphrase one of our more well-spoken politicians … It's the challenge, stupid.

CQ Millennium Award Update

There's been quite a bit of confusion over which forms to use and where to send applications for our *CQ* Millennium Award (mostly because we haven't really told you). We figured it was dumb to invest time and money in developing brand new forms that we'll just have to throw away at the end of the year, so here's what you do: Pick the regular award (DX, USA-CA or WAZ) on which you're basing your Millennium Award application (see the rules in January *CQ* or on our website for details), and request or download the regular application for that award. Next, cross out the award name and write in "*CQ* Millennium Award." Fill in the application, write out your check, and mail them both to: *CQ* Millennium Award, c/o *CQ* magazine, 25 Newbridge Rd., Hicksville, NY 11801 USA. DX stations may send international money orders or include your Master Card/Visa/Discover card number and expiration date and we will bill your account. *DO NOT send applications to the regular award managers.*

Speaking of challenges, I was amazed at how quickly some of you met the challenge of the *CQ* Millennium Award. Our first application was received in the office by January 15, based on a station working 100 countries within the first week of the year! Truly amazing! By the time you read this, we should be well on our way to beginning to process the applications and starting to get certificates into the mail. I hope you're having fun with this latest challenge, and we look forward to receiving your *CQ* Millennium Award application.

73, Rich, W2VU

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Announcements

• **Emergency Power Systems Workshop** – There will be a workshop on use of Emergency Power Systems with Photovoltaics on April 5–6 and 19–20 at the Florida Solar Energy Center, 1679 Clearlake Road, Cocoa, FL 32922. Learn how to solar power your ham station and respond to disasters. Cost of two days with manual is $25. Contact Bill Young, KA4VYH, 321-638-1443, <www.fsec.ucf.edu/pvt /disas/>.

• **The following Special Event stations will be on the air in April:**

TARA PSK31 Rumble, 0000–2400Z April 21, PSK only, on 80, 40, 20, 15, 10, 6 meters. For rules and details go to <http://www.qsl.net/wm2u/rumble.html>; e-mail: <ny2u@n2ty.org> or <wm2u@n2ty.org>.

W2NYW, from Peekskill/Cortlandt ARA first anniversary, Peekskill, New York; 1300–2100Z April 7 to 2100Z April on 7.260, 14.245, 21.375, 28.350. For certificate send QSL to PCARA, P.O. Box 32, Crompond, NY 10517 (SASE).

K3NAL, from 58th anniversary of the commissioning of the Patuxent River Naval Air Station, NAS Patuxent River Military Recreation Station, Maryland; 1300–2300Z April 1 on 28.450, 21.350, 14.275, 7.275, 3.970. QSL for all contacts (SASE), certificate for multi-band contacts (9 × 12 SASE). Send QSL to K3EZ, 41389 Richneck Court, Mechanicsville, MD 20659.

N8D, from commemoration of Jimmy Doolittle raid from aircraft carrier, Plymouth, Michigan; Stu Rockafellow ARC; 1300–2200Z April 21 and 1300–2000Z April 22 on 7270, 14720, 21370, 28370. Send QSL and SASE to Chuck Van Vleck, KB8WHQ, 9225 N. Canton Center Road, Plymouth, MI 48170.

W9DK, from Submarine Radio Reactivation weekend, aboard WW II Memorial Submarine *USS Cobia*, Manitowoc, Wisconsin; Mancorad RC; 1400–2300Z each day April 28 & 29 on 7.243, 14.243, 21.343, 28.343 (±10 kHz). For QSL or certificate send SASE to Fred Neuenfeldt, W6BSF, 4932 S. 10th St., Manitowoc, WI 54220-9121.

VE3RCX, from AGGIE Canadian Girl Guide Event, Mississauga, Ontario, Canada; Mississauga ARC; 0200–0600Z April 28 on SSB 3740, 7090, 14135 ±QRM. For QSL send QSL and SASE to MARC, c/o Michael Brickell, 2801 Bucklepost Crescent, Mississauga, ON Canada L5N 1X6. *(Note: US stamps cannot be used to send mail from Canada to the US.)*

• **The following hamfests, etc., are slated for late March and April:**

Mar. 25, **TRARC Hamfest/Computer Fair**, Palace Inn, Monroeville, Pennsylvania. Contact Roxane Gaal, WB3ROX, 312 Lawrence Ave., N. Versailles, PA 15137 (e-mail: <gaal@pgh.net>).

Apr. 1, **Southington ARA Fleamarket**, Southington High School, Southington, Connecticut. Contact Chet Bacon, KA1ILH, c/o SARA, P.O. Box 873, Southington, CT 06489 (860-628-9346; e-mail: <ka1ilh@chetbacon.com>; web: <http://www.chetbacon.com/sarahtm>). (Talk-in 145.49, 224.80, 444.25.)

Apr. 7, **South Portland Electronics Fleamarket**, American Legion Hall, S. Portland, Maine. Contact Bryce Rumery, K1GAX, 75 Ocean House Rd., Cape Elizabeth, ME 04107 (207-799-1116; e-mail: <k1gax@arrl.net>).

Apr. 7, **Lebanon ARC April Fest**, Ag-barn behind Kenneth E. Cowan Civic Center, Lebanon, Misouri. Contact Chuck Sears, AAØRK, 10901 Welch Bridge Rd., Niangua, MO 65713 (417-589-8122; e-mail: <freedom1@advertisnet.com>). (Talk-in 145.470; exams contact Bill Wheeler, KØDEW, 272 Donna Lee, Lebanon, MO 65536 [417-532-7710; e-mail: <bwheeler@advertisnet.com>].)

Apr. 7, **Columbus ARC Hamfest**, Bartholomew County 4H Fairgrounds, Community Building, SW of Columbus, Indiana. Contact Marion Winterberg, WD9HTN, 11941 W. Sawmill Rd., Columbus, IN 47201-8000 (812-342-4670; e-mail: <carc_in@yahoo.com>).

Apr. 7, **Interstate Repeater Society Spring Hamfest/Fleamarket**, Lions Club Hall, Londonderry, New Hampshire. Contact Interstate Repeater Society, P.O. Box 693, Derry, NH 03038 (e-mail: <k1llx@juno.com>). (Talk-in 146.850-/PL85.4; exams 9 AM, noon, contact Bill, AA1OC, 603-424-2857; e-mail: <bills@aa1oc.org>.)

Apr. 8, **Ak-Sar-Ben ARC Ham/Computer Auction**, Millard Social Hall, Omaha, Nebraska. Contact Scott Avery, KA4ZZQ, 1713 N. 214th St., Elkhorn, NE 68022 (e-mail: <ka4zzq@aol.com>; <www.qsl.net/k0usa>).

Apr. 8, **Madison Swapfest**, Mandt Community Center, Madison, Wisconsin. Contact Madison Area Repeater Assn., P.O. Box 8890, Madison, WI 53708-8890 (608-245-8890; <http://www.qsl.net/mara/>). (Talk-in 147.15.)

Apr. 8, **Raleigh ARS Hamfest & Computer Fair**, Jim Graham Building, NCS Fairgrounds, Raleigh, North Carolina. Contact Hank Montgomery, K4HM, 5045 Allanbrooke Ln., Fuquay-Varina, NC 27526 (919-577-1254; <k4hm@arrl.net>). (Exams W4VFJ, 919-556-8551.)

Apr. 21, **Roseland RC Hamfest**, West Orange High School, W. Orange, New Jersey. Contact Jim Howe, N2TDI (973-402-6066, e-mail: <jimn2tdi@att.net>; <www.qsl.net/k2gq>).

Apr. 21, **Ham Expo**, Bell County Expo Center, Belton, Texas. Contact Mike LeFan, WA5EQQ, 254-773-3590; <hamexpo@tarc.org>; <http://www.tarc.org>. (Talk-in 146.820–; PL123.0).

Apr. 28, **Valley of the Moon ARC Hamfest**, Sonoma Valley Veteran's Memorial Building, Sonoma, California. Contact Darrel, WD6BOR, 707-996-4494. (Talk-in 145.35, –600.)

Apr. 28, **Bankhead ARC Hamfest**, H.A. Alexander Park, Moulton Recreation Center, Moulton, Alabama. Contact Ed Weatherford, KS4B, 256-974-0436, e-mail: <ks4b@juno.com>; <www.n4idx.org>. (Talk-in 146.960, 442.425; exams 9:15 AM.)

Apr. 28, **Salkehatchie ARS Hamfest**, Windsor, South Carolina. Contact Adam Hoffman, AF4QZ, P.O. Box 93, Bamberg, SC 29003-0093 (803-245-4673; e-mail: <af4qz@arrl.net>). (Exams.)

Apr. 29, **2001 Delaware State ARRL Convention**, Nur Temple, New Castle, Delaware. Contact Hal Frantz, KA3TWG, 302-793-1080; e-mail: <hfrantz@snip.net>; <http://www.high-tech-services.com/penndel>. (Talk-in 146.955, 224.220; exams.)

Apr. 29, **Twenty Over Nine Hamfest**, Mahoning County Career & Technical Center, Canfield, Ohio. Contact Don Stoddard, N8LNE, 55 S. Whitney Ave., Youngstown, OH 44509 (330-793-7072; e-mail: <n8lne1@juno.com>). (Talk-in 147.315, 443.225.)

Apr. 29, **Moultrie AR Klub Hamfest**, Moultrie/Douglas Fairgrounds, Arthur, Illinois. Contact MARK, P.O. Box 91, Lovington, IL 61937 (days 217-543-2178, evenings 217-873-5287). (Talk-in 146.055/146.655, 449.275/444.275.)

Apr. 29, **Athens County ARA Hamfest**, Athens Community Recreation Center, Athens, Ohio. Contact Carl J. Denbow, KA8JXG, 17 Coventry Lane, Athens, OH 45701-3718 (<ka8jxg@callsign.net>).(Talk-in 145.15 [–600 offset].)

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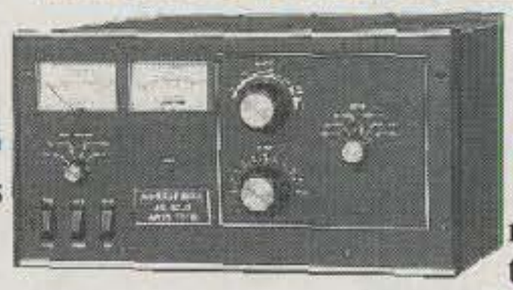

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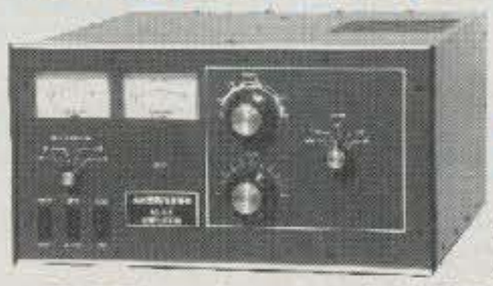

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Results of the 2000 CQ WW WPX CW Contest

BY STEVE BOLIA,* N8BJQ

Conditions were down a bit from the previous year, but plenty of DX and the last chance for many to practice before WRTC-2000 (held in Slovenia in July) made for an interesting 2000 CQ WW WPX CW Contest weekend. We had winners from all continents, and two world records and several USA and continental marks fell. The winners had to earn their titles with a combination of hard work and also a bit of luck in scheduling off times and dodging the summer thunderstorms and rapidly changing band conditions.

DX

3V8BB operated by YT1AD returned to the top of the leader board in 2000. 3V8 appears to be one of those magic places from which to operate. P3A operated by RZ9UA was not far behind in second place. Third went to F6BEE at FY5KE, with C4A (5B4ADA/9A3A) fourth and AI6V at P49V fifth. OHØXX at PZ5JR was sixth, with low power champion SU9ZZ seventh, OHØZ (LY2TA) eighth, US champ KQ2M ninth, and LY1DS as LY6M number ten.

LU5CW broke the lone single op world record with his outstanding score on 10 meters. Finishing second was 5B4/RA9JX, followed by low power winner LP1F (LU5FC) third, EU record holder T99W fourth, and LU6UO fifth. Even with less than optimum conditions there were some very nice scores on 10 meters. 9A3GW moved up from number five in '99 to lead the world in 2000 on 15 meters. GIØNWG at GIØKOW finished second, with S57AW third, low power champ HG3DX (HA3UU) fourth, and NA champion VE3BMV in at number five. VA7RR edged out 9A5W by less than 30K for the 20 meter title, with OK5W just behind in third, followed by YU1NW as YZ9A in fourth and USA champ KT3Y fifth. PY2NDX topped the 40 meter box with an excellent 3.0M score. Second place went to 9AY2K operated by 9A9A, with S57AL third, LY6K (LY3BS) fourth, and YT1BB fifth. OK5DX (OK1TN) found plenty to work on 80 meters on his way to edging out 9A6A for the title. EO6F (UXØFF) was third, EO1I fourth, and OH2W (OH2BCI) fifth in a very close race. 9A2AJ moved up from second in '99 to the top spot on 160, followed by S57M, 9A4X, YTØA (YT7AO), and HA8BE.

SU9ZZ was the low power all band champion with an outstanding 7-million-plus effort. Second place went to IH9/OL5Y, with NA champion N2GA at VP5GA third, ER6A (ER1LW) fourth, and VE3EJ fifth. Rounding out the top ten were PX2W (PY2YU), VE9DX, XQ3ZW, and RJ9J (RA9JR).

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e-mail: <n8bjq@erinet.com>

NØKE and TI5KD go over the station layout before the contest. The coaching paid off, as Phil won the QRP title as TI5N.

LP1F (LU1FC) lead the world on 10 meters, followed by LW1EXU, SV9/DL6MHW, 9A3VM, and AM5DWS. HA3UU as HG3DX topped the 15 meter box, with YM3D finishing second, Z37A (Z34A) third, YT7TY fourth, and NA champ VC6X (VE6JY) fifth. S58AL was the top 20 meter LP entry, with RUØSN second, USA champ K9QVB third, LZ3YY fourth, and RV6FZ fifth. 4Z5AX edged out S54A for 40 meter honors, with F/OK1EE third, S53F fourth, and USA champion WE1USA fifth. S57U just beat HA4FV for the top spot on 80 meters, followed very closely by 4N1A, OK1SI, and YL2M. UT1FA topped YU1UA by about 3K for Top band honors, followed by OK2SNX, UT5ECZ, and SP6LV.

USA

KQ2M returned to the top of the US leader box in 2000, with NE6N (N6RT) edging out N6MJ for second. NT1N was right on their heels in third, with AK1N (W1WEF) fourth and NB2Q (N1EU) fifth. N5RZ finished sixth, followed by WC1M, KR1G, WC4E, and AA3B.

N4BP broke his 1999 10 meter record the first day on his way to the number one spot. K4WI finished second, with LP winner KN4Y third. K9NW edged out W5TM (W5AO) and WW4T (N4PN) for 15 meter honors. KT3Y topped K3EST and K2VV for the 20 meter title. LP (low power) champ WE1USA edged out AEØM/6 for the 40 meter championship. W8AEF beat AA8U for the 80 meter title, and K1ZM was the US 160 meter champ.

WQ5L (N5FG) beat out K1VUT for the US low power all band title. N4TZ/9 finished third, with WD5K fourth and NZ8O (W8MJ) fifth. KN4Y was the low power 10 meter winner, with KA2DIV (N4GM) second. KY5N claimed the top spot on 15 meters, with WA1FCN second and K7ON third. K9QVB lead the US 20 meter entries, with AB7RW second and NJ3K third. WE1USA was the 40 meter champion, followed by WB2DVU and N4NX.

Tribander/Single Element

Three of the top six SOAB (single operator all band) entrants in the world finished on top in the T/S category. Proving that you can win with a tribander, 3V8BB, FY5KE, and PZ5JR top the T/S leader box and finished first, third, and sixth in the overall world standings. Finishing fourth was US leader NT1N, with VE2ZP fifth, NB2Q (N1EU) sixth, ZF1A (W5ASP) seventh, UN7LG eighth, UTØU ninth, and YU7BW tenth. OK1PG was the 10 meter T/S champ, as was GW3NJW on 15, G5G (GØLII) on 20, and ZS6MG on 40.

In the US, NT1N finished number one, with NB2Q (N1EU) second, NR1DX third, K7ABC (K6LL) fourth, and K7NV fifth. WA1FCN was the T/S 15 meter winner, as was AC6DD on 20.

Rookie

CT3KN turned in an excellent score to take the Rookie crown, followed by DL3JK and 9K9C (OK1TYM). F8CRH was the LP Rookie champ. 4N1N topped the 10 meter entrants, with

SI3SSA (SM3WMV) number one on 15 meters and AN7ASZ topping the 20 meter section.

Assisted

IR2W (I2VXJ) was the top of the class in the single operator assisted category. JH3AIU was second, followed by IQ2A (I2UIY), RX3APM, and US champion K5KG. 4N1SM was the 10 meter winner, as was OE3I (OE1JNB) on 15 meters. AM3AJW was the 20 meter champ, with JK1GKG finishing number one on 40 and YU1RA on Top band.

In the US, K5KG edged out W8AV for the top spot, with KW2O (K2LE) third and yours truly a distant fourth. WØTM came in fifth, and K9YO was the low power winner.

QRP/p

TI5N operated by NØKE was the QRP/p champion and new North American record holder. Second place went to UN4L operated by RN9AO with a new Asiatic QRP record. In third was European champion LY2FE, followed very closely by HA2A and VE1ZJ. LU7EE was the 10 meter winner, with PQ2Q (PY2WC) second. NA4CW edged out RZ6HX for the 15 meter title, and DJ1YFK was the 20 meter winner. TE1W (W8QZA) turned in a great 40 meter score to lead the world, with UY6IM and YT1IA leading on 80 and 160.

In the US, KG5U was the winner, with N7IR second, K7RE third, AA1CA fourth, and W4DEC fifth. NA4CW topped N4OT and W3PP for 15 meter honors.

Multi-Ops

HC8N (N5KO and K6AW operating) shattered the world record on their way to their multi-single win. 6Y8A (K2KW and K6XX) also broke the '98 record with their second-place finish. Third went to 5B4AGD, with 5B4/RS3A fourth and V25A in fifth. ZX5J was sixth, followed by E41/OK1DTP, OD5/OK1MU, 9A7A, and WK6LA. The multi-multi title went to 4OØA, with NA champion WL7E finishing second, HG6Y third, LY7A fourth, and NR4M fifth.

WK6LA operated by WRTC teammates K6LA and K5ZD warmed up with a record-breaking finish in the US multi-single race. Second place went to AB2E operated by AB2E and K3WW. N4WW was third, with N3BB fourth and KW9DX fifth. NR4M edged out NY4A for the multi-multi crown, with W4MYA in third, WY2OOO fourth, and W1MK fifth.

Club Competition

The club competition was dominated by the Contest Club Finland's record-shattering 256 million points. Second place went to the Yankee Clipper Contest Club, with the Northern California Contest Club third, the Slovenia Contest Club fourth, and the Potomac Valley Radio Club fifth.

The Rest of the Story

The DX and prefix hunters had plenty to chase during the contest. With DX stations such as 5R8FU, TZ6DX, 3W7CW, YI9OM, XX9TKW, T88SH, JU4Y, and TF3IRA active, many managed to work a new country or band country. In addition, there were plenty of new and unique prefixes on. Z35, Z37, L99, YQØ, UZ2, EO1, SY1, 9K9, S5ØØ, SI3, SI9, 5P1, and the new Swedish prefixes made the prefix hunters happy. Thanks to all those who took the time to get on from some of the rarer DX locations, those who made the special effort to get a new contest prefix, and also to the many groups who went on an expedition for the contest. Your efforts make the contests much more enjoyable for the rest of us.

2000 was a good year for electronic logs, and also a bad year. The good news is we got more of them (about 65–70% of all logs were electronic). The bad news is, with the Y2K problems with some older software, quite a bit more effort was needed to get some of them into the database. Hopefully by the 2001 contest, everyone will have updated to a Y2K compliant version of your favorite software. If you can't upgrade for what ever reason, please use a text editor and correct the dates in your logs.

Please send your log in CABRILLO format if at all possible. We will be changing to a database program that is designed to work with CABRILLO files without any other manipulations. Just about all of the popular logging programs should be able to output the required file. If you can't send CABRILLO, ASCII files such as CT's *.all or TR's *.dat files are still accepted. If you send the CABRILLO file, that is all that is required. If you send something else, I will need a summary sheet also. As always, you can email your logs to <N8BJQ@erinet.com>. You will get a confirmation back from me once I open your e-mail and verify that I can read your file. Confirmations may be a bit slow in the first couple of weeks after the contest, as it takes me a bit to process each message. The only robot here is me. You can check the WPX Contest website <http://ourworld.compuserve.com/homepages/n8bjq/> for a list of logs received, contest rules, and past results and some other goodies. Please check the list to make sure that my nimble fingers have placed you in the correct category.

TROPHY WINNERS

SINGLE OPERATOR – ALL BAND

WORLD: Steve Bolia, N8BJQ Trophy. Won by: **Station 3V8BB operated by Hrane Milosevic, YT1AD.**
USA: Dennis Motschenbacher, K7BV Trophy. Won by: **Bob Shohet, KQ2M.**
EUROPE - Ivo Pezer, 5B4ADA/9A3A Trophy. Won by: **Station OHØZ operated by Andrius Ignotas, LY2TA.**
OCEANIA: Tom Morton, K6CT Trophy. Won by: **Station NH7A operated by Mike Sato, KH6TO**.
CANADA: Radio Amateurs of Canada (RAC) Trophy. Won by: **Yuri Onipko, VA3UZ**.
JAPAN: The DX Family Foundation Trophy. Won by: **Satoshi Hara, JH5FXP**.
WORLD LOW POWER: Steve Bolia, N8BJQ Trophy. Won by: **Jaroslav Jamrich, SU9ZZ.**
USA LOW POWER: Ron Stark, KU7Y Trophy. Won by: **Station WQ5L operated by R. Floyd Gerald, N5FG.**
CANADA LOW POWER: Amateur Radio League of Alberta Trophy. Won by: **John Sluymer, VE3EJ.**
ZONE 3 HIGH POWER: Jim Pratt, N6IG Trophy. Won by: **Station NE6N operated by Doug Brandon, N6RT.**
USA QRP/p: *CQ* Magazine Trophy. Won by: **Dale Martin, KG5U.**

SINGLE OPERATOR – SINGLE BAND

WORLD: Pedro Piza Sr, KP4ES Memorial Trophy. Won by: **Ernesto Grueneberg, LU5CW (28 MHz).**
WORLD 7 MHz: William D. Johnson, KVØQ Trophy. Won by: **Rafael Martins, PY2NDX.**
WORLD 3.5 MHz: Lance Johnson Digital Graphics Trophy. Won by: **Station OK5DX operated by Slavek Zeller, OK1TN.**
OCEANIA: D. Craig Boyer, AH9B Trophy. Won by: **Michael Gibson, KH6ND (28 MHz).**
USA: Kansas City DX Club Trophy. Won by: **Phil Allardice, KT3Y (14 MHz).**
USA 28 MHz: Bernie Welch, W8IMZ Memorial Trophy. Won by: **Bob Patten, N4BP.**
USA 21 MHz: Wayne Carroll, W4MPY Trophy. Won by: **Mike Tessmer, K9NW.**

MULTI-OPERATOR – SINGLE TRANSMITTER

WORLD: Ron Blake, N4KE Trophy. Won by: **Station HC8N operated by N5KO & K6AW.**
USA: Austin Regal, N4WW Trophy. Won by: **Station WK6LA operated by K6LA & K5ZD.**

MULTI-OPERATOR – MULTI-TRANSMITTER

USA: Yankee Clipper Contest Club Trophy. Won by: **Station NR4M operated by K7SV, NR4M, K1SE, K4EU, K4EC, RA3AUU, K4GMH, K4ZW, WA4JUK**.

CONTEST EXPEDITION

WORLD: Steve Bolia, N8BJQ Trophy. Won by: **Station 6Y8A operated by K2KW & K6XX.**

COMBINED SSB/CW
SINGLE OPERATOR – ALL BAND

WORLD: Al Slater, G3FXB Memorial. Won by: **Hrane Milosevic, YT1AD (3V8BB).**
EUROPE: Les Nouvelles DX Group Trophy. Won by: **Andrius Ignotas, LY2TA (LY7Z & OHØZ).**
USA: D. Craig Boyer, AH9B Trophy. Won by **Bob Shohet, KQ2M**

Club (SSB & CW)

WORLD: *CQ* Magazine Trophy. Won by: **Contest Club Finland.**
USA: Oklahoma DX Association Trophy. Won by: **Yankee Clipper Contest Club.**

WORLD TOP SCORES

SINGLE OPERATOR ALL BAND

3V8BB (YT1AD)	11,415,184
P3A (RZ9UA)	10,090,962
FY5KE (F6BEE)	9,625,620
C4A (5B4ADA/9A3A)	9,436,716
P49V (AI6V)	8,797,368
PZ5JR (OHØXX)	7,827,358
*SU9ZZ	7,295,574
OHØZ (LY2TA)	7,240,444
KQ2M	6,486,690
LY6M (LY1DS)	6,332,616
NE6N (N6RT)	5,931,198
N6MJ	5,847,625
NT1N	5,667,572
VA3UZ	5,640,674
OK1RF	5,605,717
SP7GIQ	5,551,139
*IH9/OL5Y	5,455,393
M5X (G4TSH)	5,221,820
*VP5GA (N2GA)	5,204,328
UPØL (UN9LW)	5,059,353

28 MHz

LU5CW	5,531,399
5B4/RA9JX	2,715,866
*LP1F (LU5FC)	2,408,049
T99W	2,115,365
LU6UO	1,960,782
KH6ND	1,523,008
OK2RZ	1,465,296
*LW1EXU	1,459,512
S51F	1,366,008
UUØJX	1,330,142

21 MHz

9A3GW	4,411,860
GIØKOW (GIØNWG)	4,141,600
S57AW	3,608,372
*HG3DX (HA3UU)	3,401,287
VE3BMV	3,367,964
8S3G (SMØGNU)	3,169,262
OM5M (OM3BH)	3,105,288
5B4/RW9UP	3,070,419
OM3A (OMØWR)	2,978,909
RNØA (UAØAGI)	2,902,068

14 MHz

VA7RR	3,242,172
9A5W	3,213,280
OK5W	3,039,434
YZ9A (YU1NW)	2,825,048
KT3Y	2,810,440
UU7J (UUØJM)	2,628,340
LZ7G (LZ1NK)	2,511,528
OM3NA	2,372,832
UY3QW	2,308,875
K3EST	2,261,124

7 MHz

PY2NDX	3,005,954
9AY2K (9A9A)	2,308,670
S57AL	1,494,480
LY6K (LY3BS)	1,298,700
YT1BB	1,272,680
YP3A (YO3KPA)	1,256,119
S52O	1,154,440
UW5Y (US2YW)	1,028,592
RZ4HF	962,885
SV/OK1YM	926,772

3.5 MHz

OK5DX (OK1TN)	496,128
9A6A	416,939
EO6F (UXØFF)	393,808
EO1I	348,468
OH2W (OH2BCI)	334,170
YU1KR	311,952
OK2GZ	308,580
LY3CW	279,310
*S57U	259,056
*HA4FV	244,524

1.8 MHz

9A2AJ	125,388
S57M	95,691
9A4X	88,976
YTØA (YT7AO)	76,616
HA8BE	72,933
*UT1FA	62,322
OH4MFA	61,202
*YU1UA	59,015
UR6QA	53,460
UX5NQ	45,952

LOW POWER SINGLE OPERATOR ALL BAND

SU9ZZ	7,295,574
IH9/OL5Y	5,455,393
VP5GA (N2GA)	5,204,328
ER6A (ER1LW)	4,948,640
VE3EJ	4,183,200
PX2W (PY2YU)	3,852,440
VE9DX	3,623,001
XQ3ZW	3,568,000
RJ9J (RA9JR)	3,195,780
UP6P (UN6P)	3,145,629
OM6T (OM5AW)	3,060,540
C6AKA (DL7VOG)	3,030,560
LY3BA	3,014,620
WQ5L	2,845,774
BD4ED	2,734,164
IKØYVV	2,714,432
K1VUT	2,666,260
S57J	2,606,245
S59AA	2,579,373
LZ9A	2,351,106

28 MHz

LP1F (LU5FC)	2,408,049
LW1EXU	1,459,512
SV9/DL6MHW	1,139,526
9A3VM	921,195
AM5DWS	872,217
HA8RH	849,815
YU1AU	655,196
YT1MP	520,205
UA9YAB	496,620
4N1FG	489,392

21 MHz

HG3DX (HA3UU)	3,401,287
YM3D	2,823,786
Z37A (Z34A)	2,641,175
YT7TY	1,963,170
VC6X (VE6JY)	1,735,250
S5ØØS	1,646,791
LU1FC	1,368,389
3Z9XCN	1,147,733
IU9AF	1,131,939
TI2WGO	924,912

14 MHz

S58AL	2,004,078
RUØSN	1,506,025
K9QVB	1,257,844
LZ3YY	995,796
RV6FZ	815,285
HA3LN	733,095
UA9AFS	727,983
VA3SY	686,140
JHØEPI	666,536
VE6JY	619,752

7 MHz

4Z5AX	814,540
S54A	779,945
F/OK1EE	734,187
S53F	697,230
WE1USA	567,155
T98R	543,030
LY2BLQ	365,787
SP2HPD	346,574
YZ1V	312,456
WB2DVU	264,750

3.5 MHz

S57U	259,056
HA4FV	244,524
4N1A	213,905
OK1SI	193,734
YL2PM	148,000
OK1FNJ	145,950
YL3RW	137,200
UT5PW	135,548
UA6ARD	106,920
OK1HGM	97,916

1.8 MHz

UT1FA	62,322
YU1UA	59,015
OK2SNX	44,268
UT5ECZ	24,255
SP6LV	6,312

TRIBANDER/SINGLE ELEMENT

3V8BB (YT1AD)	A	11,415,184
FY5KE (F6BEE)	A	9,625,620
PZ5JR (OHØXX)	A	7,827,358
NT1N	A	5,667,572
VE2ZP	A	4,852,304
NB2Q (N1EU)	A	4,800,976
ZF1A (W5ASP)	A	4,732,894
UN7LG	A	4,656,528
UTØU (UT5UDX)	A	4,621,807
YU7BW	A	4,221,225
OK1PG	28	199,178
UA9LP	28	147,600
*RA1ACJ	28	100,280
*GW3NJW	21	609,771
*WA1FCN	21	541,947
*VE3MQW	21	315,590
G5G (GØLII)	14	1,879,471
VE3KZ	14	1,845,337
OH3BU	14	1,151,876
*ZS6MG	7	185,256

BAND RESTRICTED

*OH2CV	A	639,515
*4N7RGH	A	457,344
*UR5FCM	A	443,579
OK1CRM	A	357,780
*JR5EHB	A	210,693

ROOKIE

CT3KN	A	3,143,598
DL3JK	A	2,492,708
9K9C (OK1TYM)	A	1,082,908
*F8CRH	A	1,069,872
*SQ2HEB	A	513,240
4N1N	28	259,560
*F8CNR	28	31,232
SI3SSA (SM3WMV)	21	1,294,850
*AN7ASZ	14	494,500
*SI9AM (SM3WMU)	14	243,110

ASSISTED

IR2W (I2VXJ)	A	5,982,387
JH3AIU	A	4,338,446
IQ2A (I2UIY)	A	3,958,240
RX3APM	A	3,844,980
K5KG	A	3,783,624
VA3RU	A	3,761,787
W8AV	A	3,687,438
KW2O	A	3,526,908
R3K (RZ3FA)	A	3,429,510
N8BJQ	A	2,719,167
*4N1SM	28	280,029
DJ4KW	28	51,294
OE3I (OE1JNB)	21	1,467,804
W2WB	21	1,140,048
IT9BLB	21	1,005,077
PA3EWP	21	959,740
AM3AJW	14	1,217,268
JK1GKG	7	118,560
*YU1RA	1.8	54,530

QRP/p

TI5N (NØKE)	A	1,976,118
UN4L (RN9AO)	A	1,184,462
LY2FE	A	1,173,322
HA2A	A	1,154,531
VE1ZJ	A	1,013,502
LY1DT	A	877,030
KG5U	A	843,192
YU1LM	A	770,784
S53MA	A	709,243
VE3KP	A	631,104
LU7EE	28	1,075,612
PQ2Q (PY2WC)	28	439,752
4X1VF	28	352,683
NA4CW	21	427,986
RZ6HX	21	408,432
N4OT	21	251,658
DJ1YFK	14	707,230
RZ6HGD	14	173,436
G3LHJ	14	140,448
TE1W (W8QZA)	7	306,819
YO9GZU	7	187,798
JA2HUN	7	34,131
UY6IM	3.5	215,695
SP4GFG	3.5	162,122
OM3THV	3.5	32,205
YT1IA	1.8	1,248

MULTI-OPERATOR SINGLE TRANSMITTER

HC8N	18,422,455
6Y8A	13,931,420
5B4AGD	12,527,593
5B4/RS3A	12,267,072
V25A	11,853,855
ZX5J	11,456,088
E41/OK1DTP	10,071,096
OD5/OK1MU	9,887,640
9A7A	9,091,620
WK6LA	8,219,211
RU1A	7,666,218
IY4W	7,543,426
AN6IB	7,407,920
YL4U	6,751,164
AB2E	6,702,250
N4WW	6,467,725
Z3ØM	6,316,122
N3BB	6,312,600
EN7Z	6,296,476
OF3F	6,293,708

MULTI-OPERATOR MULTI-TRANSMITTER

4OØA	20,932,902
WL7E	15,833,953
HG6Y	13,711,011
LY7A	11,701,200
NR4M	11,677,929
AN4ML	11,330,266
NY4A	10,826,599
ES5Q	10,650,640
SKØX	10,309,036
W4MYA	9,857,622
8S5X	9,006,462
OL7W	7,938,024
WY2OOO	5,534,904
K1MK	5,261,280
WR3L	4,960,361

**Low power*

USA TOP SCORES

SINGLE OPERATOR ALL BAND

KQ2M	6,486,690
NE6N (N6RT)	5,931,198
N6MJ	5,847,625
NT1N	5,667,572
AK1N (W1WEF)	4,882,240
NB2Q (N1EU)	4,800,976
N5RZ	4,743,895
WC1M	4,659,020
KR1G	4,378,050
WC4E	4,203,910
AA3B	4,123,000
K5MA	4,002,580
NR1DX	3,897,702
AI7B (W7GG)	3,799,118
K7ABC (K6LL)	3,588,264
K3ZO	3,470,688
KC7V	3,362,100
K7NV	2,960,958
N9AG	2,939,916
AE6Y	2,905,728

28 MHz

N4BP	1,297,890
K4WI	659,839
*KN4Y	213,720
W3AZ	130,088
*KA2DIV (N4GM)	48,580

21 MHz

K9NW	2,818,244
W5TM (W5AO)	2,610,951
WW4T (N4PN)	2,449,062
K4OAQ	2,112,000
WA6O	2,056,236

14 MHz

KT3Y	2,810,440
K3EST	2,261,124
K2VV	2,197,345
*K9QVB	1,257,844
*AB7RW	502,539

7 MHz

*WE1USA	567,155
AEØM/6	523,053
*WB2DVU	264,750
*N4NX	255,045
*KV8Q	249,996

3.5 MHz

W8AEF	26,076
AA8U	2,436

1.8 MHz

K1ZM	3,465

LOW POWER SINGLE OPERATOR ALL BAND

WQ5L (N5FG)	2,845,774
K1VUT	2,666,260
N4TZ/9	1,977,330
WD5K	1,760,730
NZ8O (W8MJ)	1,748,960
KN7Y	1,588,248
N4IG	1,548,870
WK2G	1,525,443
N1WR	1,490,676
NX6T (K6AM)	1,264,572

28 MHz

KN4Y	213,720
KA2DIV (N4GM)	48,580
KØCIE	20,384
WD6DX	12,880
KW7R	10,948

21 MHz

KY5N	621,712
WA1FCN	541,947
K7ON	252,008
W6YJ	116,622
W9ILY	101,528

14 MHz

K9QVB	1,257,844
AB7RW	502,539
NJ3K	200,376
W8UMR	141,440
K9GY	102,800

7 MHz

WE1USA	567,155
WB2DVU	264,750
N4NX	255,045
KV8Q	249,996
N5DO	237,820

TRIBANDER/ SINGLE ELEMENT

NT1N	A	5,667,572
NB2Q (N1EU)	A	4,800,976
NR1DX	A	3,897,702
K7ABC (K6LL)	A	3,588,264
K7NV	A	2,960,958
KZ5D	A	2,530,107
N2ED	A	2,515,185
ND5S	A	2,188,914
K4BAI	A	2,164,428
NW6S	A	1,924,773
*WA1FCN	21	541,947
*W6YJ	21	116,622
AC6DD	14	453,747

ROOKIE

*KG4BIG	A	329,412
*K3DSP	A	115,432

ASSISTED

K5KG	A	3,783,624
W8AV	A	3,687,438
KW2O (K2LE)	A	3,526,908
N8BJQ	A	2,719,167
WØTM	A	2,606,310
K9NR	A	2,150,874
KC1F	A	1,634,050
*K9YO	A	1,363,205
WF2B (K2ONP)	A	1,270,583
KD6WW	A	1,069,206

QRP/p

KG5U	A	843,192
N7IR	A	551,688
K7RE	A	428,247
AA1CA	A	288,133
W4DEC	A	235,848
N9CIQ	A	230,300
W3BBO	A	160,146
AC7AF	A	99,102
WZ2T	A	47,302
W8UE	A	44,278
NA4CW	21	427,986
N4OT	21	251,658
W3PP	21	180,063
WA6FGV	21	105,763
W1CTN	21	27,169

MULTI-OPERATOR SINGLE TRANSMITTER

WK6LA	8,219,211
AB2E	6,702,250
N4WW	6,467,725
N3BB	6,312,600
KW9DX	4,781,969
NM5O	4,630,015
W6YX	4,627,470
K7RI	3,869,712
NC7J	3,423,732
K7AW	2,321,312

MULTI-OPERATOR MULTI-TRANSMITTER

NR4M	11,677,929
NY4A	10,826,599
W4MYA	9,857,622
WY2OOO	5,534,904
K1MK	5,261,280
WR3L	4,960,361
NJ4U	4,191,924
K2XR	1,832,220

**Low power*

Thanks to NA2X for his help with the logs again. Bob keeps volunteering and always comes through on time. Also, thanks to EA3DU, OH2EH, and the French *CQ* gang for their help with some of the European logs. Thanks too in advance to WT4I, who has volunteered to help with database and log scoring software for the 2001 contests.

The 2001 WPOX CW Contest will be 26 and 27 May. Mark your calendar and spend some time on the air. You will enjoy yourself and might work a new one. Again, thanks to all who participate and those who help to make this possible. See you on the air!

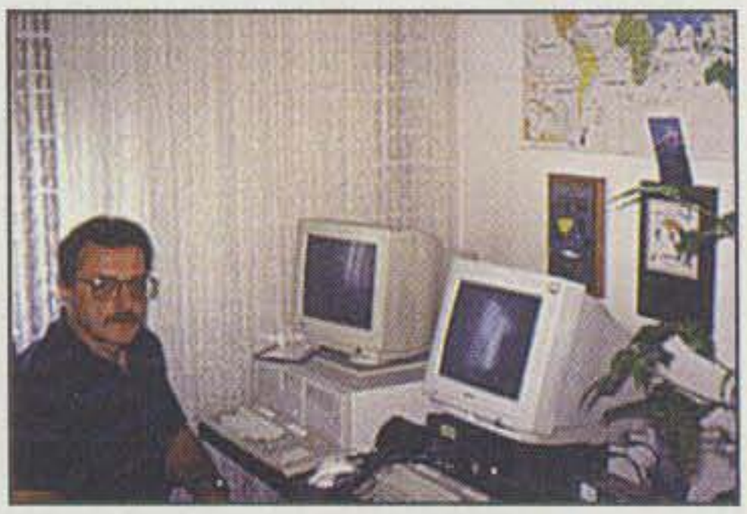
73, Steve, N8BJQ

Random Comments

"Unfortunately I never have enough time to compete this weekend! So, for a change of pace I decided to spend what time I have on 10 meters. LP on 10, and no chance to operate during any expected EU opening means scanning a virtually dead band most of the time. Should have been a dentist, because this is like pulling teeth!!....**VE3STT**. Once again the flux was over 150 but still didn't work any EU on 10 meters. It felt like I was operating in last year's contest.... **WD6DX**. About the same number of hours and exactly the same equipment as last year, but a somewhat smaller score. Perhaps the QRN was higher or the operator is wearing out....**W3CP**. I had planned a more extensive effort; however, due to a sudden problem arising at work, I had to scale back my efforts. Thought band conditions were strange, but still managed fairly decent run rates....**WF2B**. A fine contest as usual. Lots of interesting DX to work (new ones galore!). However, propagation with the East coast of the US wasn't as productive as it usually is....**F6JSZ**. While trying to break my 1992 P31A record, I broke my Schurr paddle instead....**C4A**. U was hard to come by, especially the first night. One KH6, one VK, and that was all from the Pacific. But wait—there's always next year!....**KV8Q**.

Just for fun. A few hours between house/yard chores and Indy 500. Mostly S&P....**KJ9C**. Next year outside antennas and coverage of 40 and 80 meters! ....**NO5W**. T-storms during weekend created havoc and made 80 and 160 useless. The other bands were okay, although 10 didn't open up for us west of the Mississippi. The Europeans on 10 Saturday morning sounded the same whether beaming direct or skewed path over Africa....**KØOU**. Even though propagation was poor, I was able to run EU Saturday until 2200 GMT, but no JA's from here. Sunday was really slow but I had fun anyway. Thanks everyone....**K4WI**. The best contest I entered since I have been licensed.... **M4T**. Chores + no amp + bad condx + no time = my score....**N2CU**. Fun as always. Bands seemed "flatter" than hoped for. Got panicky the first evening when I couldn't find the JA boys. Finally found them later in the contest. They really do help us (me) "left coasters"....**W6TK**. The one point for in-country QSOs really makes the contest very interesting....**N4UH**. First contest at new location. Certainly not as much fun as being at XE2DV. This was station shakedown and I found lots of things to change. It was also the first contest I have done in 40 years with just a *vertical*. I know now why there is not a reflector site called "Vertical talk"!....**WZ7ZR**.

Who stole the ionosphere this year??....**G3ZRJ**.



Leo, S50R, was one of the ops at S5C.

Someone has stolen 10 meters and replaced it with another band!....**GØMTN**. I've got two targets: make over 2K QSO and 3M points. First was achieved, as good 10 meter sporadic opening second day helped to make cheap but quick QSOs, but worse than normal propagation to USA, especially 15 meters second day killed my 3M target....**LY2OX**. What great activity from S5! This is a great contest for a small station....**NT1N**. Thanks for contest. 10 meters wasn't nearly as good as SSB WPX, so my 10 meter count was down. Maybe it is due to the time of year. Thanks for new category!! It is a good idea for us guys on a small lot in the suburbs....**W8VE**. This is a great contest. Conditions were generally quite good; there was plenty of activity. My biggest thrill was to be called by S21CW!....**VE2ZP**. I work with 100 watts and multiband vertical training my self for WRTC....**LW8EXF**.

(Continued on page 104)

Affordable World Class DX

12 and 10 Meter Bands

Multi-Mode

Repeater Tone Option

Noise Blanker

The new RCI-2950DX (25W PEP) and RCI-2970DX (150W PEP) offer a unique opportunity for operators to own a two band/multi-mode transceiver at a price anyone can afford. Tech Plus waiting to upgrade? This rig can get you started on HF!

Whether your interests are in contests, DX, 10-meter FM repeaters or digital modes, this radio will give you many hours of enjoyment while leaving extra money for that special antenna you've been wanting. The affordable 2950DX is less than $300, while the value-priced 2970DX is under $430.

The redesigned receiver front-end, extensive shielding and improved stability, combine to offer a 2-band rig that excels where many of the multi-band radios begin to lose performance.

As a stand-alone or companion to your existing rig, the RCI-2950DX or RCI-2970DX can easily go from your shack to your car in minutes. Field day or supplemental club station, these rigs will help you get the most of our recent band openings on 12 and 10 meters.

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Email: rci@rangerusa.com **website:** www.rangerusa.com

401 West 35th Street National City, CA 91950

How can something so small do so much? Very well, thank you, says N7RR in this in-depth look at Yaesu's new backpackable, shoulder-strap portable, HF/VHF/UHF multimode transceiver.

CQ Reviews:

The Super-Portable Yaesu FT-817 Transceiver

BY BRUCE PRIOR,* N7RR

In case you haven't been looking at the small print in the ads lately, Yaesu's parent company has changed its name to Vertex Standard, which is why you'll see that name mentioned throughout this review. The same company, same management, new name. That's all.

Before I turn this page over to Bruce, I got my first chance to see the FT-817 "in person" at the Miami Tropical Hamboree in February. If you've been around long enough to remember the early days of 2 meter FM, think of a Drake TR-22 on steroids! That's the 817. —W2VU

The Yaesu FT-817 HF/VHF/UHF transceiver and microphone. (Photo courtesy Vertex Standard.)

Small, light, and powerful. That's how to describe the Yaesu FT-817 in one sentence. How could such a little rig make such a big splash? The new all-mode, almost-all-band QRP transceiver made by Vertex Standard of Japan is having a big impact on the hobby because it squeezes a whole lot of radio into a tiny, lightweight package. Yes, it's great for backpackers, but business travelers and all sorts of vacationers and experimenters are adding the FT-817 to their amateur radio equipment as well.

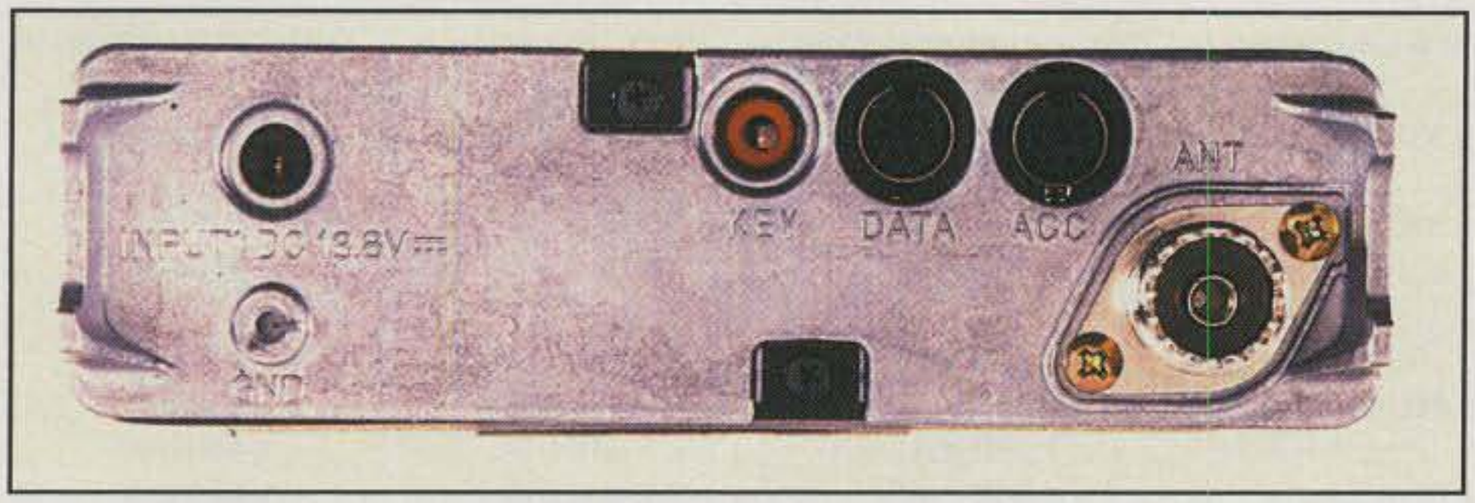
The FT-817 weighs about the same as a quart of milk. It's a full-featured amateur radio station that is small enough to get lost inside a school knapsack. By carrying the FT-817 with its shoulder strap and using its rubber-duck antenna, an amateur can operate it conveniently on VHF or UHF while walking on a trail. Covering all amateur bands from 160 to 6 meters, plus 2 meters and 70 centimeters, this multimode rig even operates on Alaska's universal emergency frequency of 5167.5 kHz.

Just this one little rig could be used to talk across town on AM on 160 meters, to join an LSB 75 meter roundtable, to share Field Day SSTV pictures on 20 meters, to send some traffic through an amateur satellite, to work some 15 meter DX on CW or MFSK8, to download a WEFAX image, then to check into an FM VHF repeater club net. Finally, it could be placed in a backpack for mountaintop SSB or CW operating on any of those bands. In an emergency, the resilience of this take-anywhere radio could be priceless. It would be difficult to find any place on the surface of the Earth, day or night, where 5 watts would not be sufficient to quickly contact another amateur on at least one of the FT-817's 13 bands.

While the FT-817 is compatible with many adventure activities, including backpacking, spelunking, cycling, snowshoeing, skiing, and mountaineering817, it has many home-station uses as well.

Vertex Standard has included most of the features of its elder sibling, the FT-100, in this new rig. The radio is plug-compatible with digital operation, including computer-based modes that have not yet been invented! The FT-817's display can be turned into a spectrum scope, showing band activity above

**853 Alder St., Blaine, WA 98230-8030*
e-mail: <n7rr@arrl.net>



The rear panel of the FT-817. (Photo courtesy Vertex Standard)

and below the operating frequency. The rig can be controlled with a computer. The transceiver has a built-in mode-B electronic CW keyer with normal and reverse sideband tuning, which allows cross-mode QSOs on CW with SSB stations when conditions won't allow a QRP SSB signal to get through. Like most current VHF and UHF rigs, the FT-817 has CTCSS and DCS for repeater access and selective calling.

CW operators may want to install an optional 7-pole Collins mechanical filter rated for 500 Hz at –6 dB and 2.0 kHz at –60 dB, but it's pricey.[1] With the CW filter installed and using other receiver features such as the adjustable automatic gain control, IF shift, and control of both the preamplifier and attenuation, the FT-817 is a fine CW rig. A similar 2.3 kHz SSB filter is also available. Only one filter can be installed at a time. Swapping filters is about a 10-minute job, so the same radio could be used with appropriate filters for different phone and CW contests.

Some owners who plan to use the FT-817 in situations with markedly changing temperatures may elect to install the optional high-stability TCXO-9 module. The TCXO-9 is a tiny plug-in *temperature-compensated crystal oscillator* module for frequency stability. It is not a crystal oven, so it does not significantly change receive current consumption. For routine operation, however, the rig is plenty stable with the standard unit. The best test is to try the MFSK modes, which require a stable frequency for decoding signals. I was able to acquire and hold a long MFSK16 transmission within one minute of turning on the rig from a cold start.

To protect the rig and the operating surface, I added four self-sticking, clear cushion feet (Archer Cat. No. 64-2365) to the bottom of the steel enclosure.

Overall Design

The FT-817 is built on two major circuit boards which are mounted above and below a cast-aluminum internal chassis, covered by a sheet-steel clamshell enclosure. The receiver is a double-conversion superheterodyne design, employing a 68.33 MHz first IF on most bands and a 10.7 MHz first IF for wideband broadcast FM and TV audio reception. (Did I mention that it also receives FM broadcast and TV audio frequencies?) The second IF is 455 kHz. The minimum frequency synthesizer steps are 10 Hz on CW, SSB, and packet modes; 100 Hz for AM and FM; and 50 kHz for WFM. Vertex Standard specifications claim the following receiver sensitivities for 10 dB S/N on SSB, digital, and CW modes: 0.25 µV from 1.8–30 MHz, 0.2 µV from 50–54 MHz, and 0.125 µV for 144–148 MHz and 430–450 MHz.

Features

Here are some of the features Yaesu managed to pack into this diminutive transceiver:

- Size: 5.31"W × 1.5"H × 6.5"D (135 mm × 38 mm × 165 mm)
- Base weight: 2.05 pounds (930 g)
- 5 W nominal RF output power, adjustable to 2.5 W, 1 W, or 500 mW
- 1 W audio power
- CW, LSB, USB, AM, PSK-31, and other user-defined AFSK digital modes; SSTV, WFM, NFM, FM
- Receive current: see table
- Transmit current: see table
- Bar-graph power output, S-meter, SWR, and modulation metering
- AM aircraft reception
- Receive frequencies: 100 kHz to 56 MHz, 76 to 154 MHz, and 420 to 470 MHz
- Transmit frequencies: all amateur bands from 160 to 2 meters, plus 70 cm
- Semi-break-in CW (adjustable down to 10 ms delay)
- VOX with adjustable delay
- RF gain/squelch control
- Noise blanker
- IF shift control
- 200 regular memories which can be labeled alphanumerically and are partitionable into groups of up to 20 memories each
- 8 special-purpose memories for home channels, quick memory bank, Alaska Emergency Channel, and band-limits
- AGC with fast, slow, auto, and off settings
- Adjustable CW pitch and frequency offset
- Selection of CW paddle normal and reverse connections
- Mode-B iambic CW keyer
- IPO (intercept point optimization), for receiving without a preamplifier
- Selectable receiver front-end attenuator
- Automatic repeater shift
- Auto-range transpond system (ARTS™)
- Automatic memory-loading system
- Cloning capability
- Computer control capability
- Automatic power off
- Transmit time-out timer
- Options: NiCd battery and wall charger; high-stability, temperature-controlled crystal module; 10-pole 2.3 kHz Collins mechanical SSB filter; 7-pole 500 Hz Collins mechanical CW filter; DTMF hand microphone, desk microphone; data cable; CAT (computer control) interface cable

Ergonomics

Yaesu designers allow the operator to switch between blue and amber LCD display illumination. I prefer the contrast the amber display offers, but others may find the blue better for them.

All but one of the controls are in front or on top very near the front of the radio. The only thing that plugs into the front is the BNC antenna. There's no room in front for anything else. The external power socket, accessory socket for computer control, data socket, key or keyer jack, and SO-239 antenna connector are in the rear. These sockets are protected by two cast-aluminum "feet" which project along the sides of the rear. The microphone and earphones plug into the right side, where a slide switch for earphone or external speaker operation is located. That may seem to favor right-handed operators, but southpaw phone operators actually have an advantage with the FT-817. They can conveniently hold the microphone in the right hand while doing their logging and note-taking with the left.

The smooth-turning FT-817 tuning knob is smaller than the famous Yaesu knob which many Elecraft K2 operators are using. In an emergency, the up and

FT-817 Setting	With Illumination	Without Illumination	With Illumination	Without Illumination
	Front Antenna Enabled		Rear Antenna Enabled	
receive with large external speaker & SP switch position	330 mA	310 mA	350 mA	330 mA
receive with internal speaker	320 mA	290 mA	340 mA	310 mA
receive with earphones & PH switch position	320 mA	290 mA	340 mA	310 mA
receive squelched	280 mA	250 mA	310 mA	280 mA
transmit 5 W output	1 850 mA	1 820 mA	1 870 mA	1 850 mA
transmit 2.5 W output	1 420 mA	1 390 mA	1 440 mA	1 410 mA
transmit 1 W output	1 070 mA	1 040 mA	1 100 mA	1 070 mA
transmit 500 mW output	910 mA	880 mA	930 mA	900 mA

Table I– FT-817 current drain with 13.5 VDC external power supply.

down buttons on the microphone can be programmed to control the internal iambic CW keyer piano-key fashion. I do not recommend using that feature for normal operation. I mount my tiny G4ZPY paddles with their magnetic base on the top of the steel cabinet of my FT-817.

The audio is loud enough for operating the FT-817 inside a noisy truck, and its quality is fine for listening to classical music on the FM broadcasting band, a remarkable performance for so small a speaker.

Power Supply

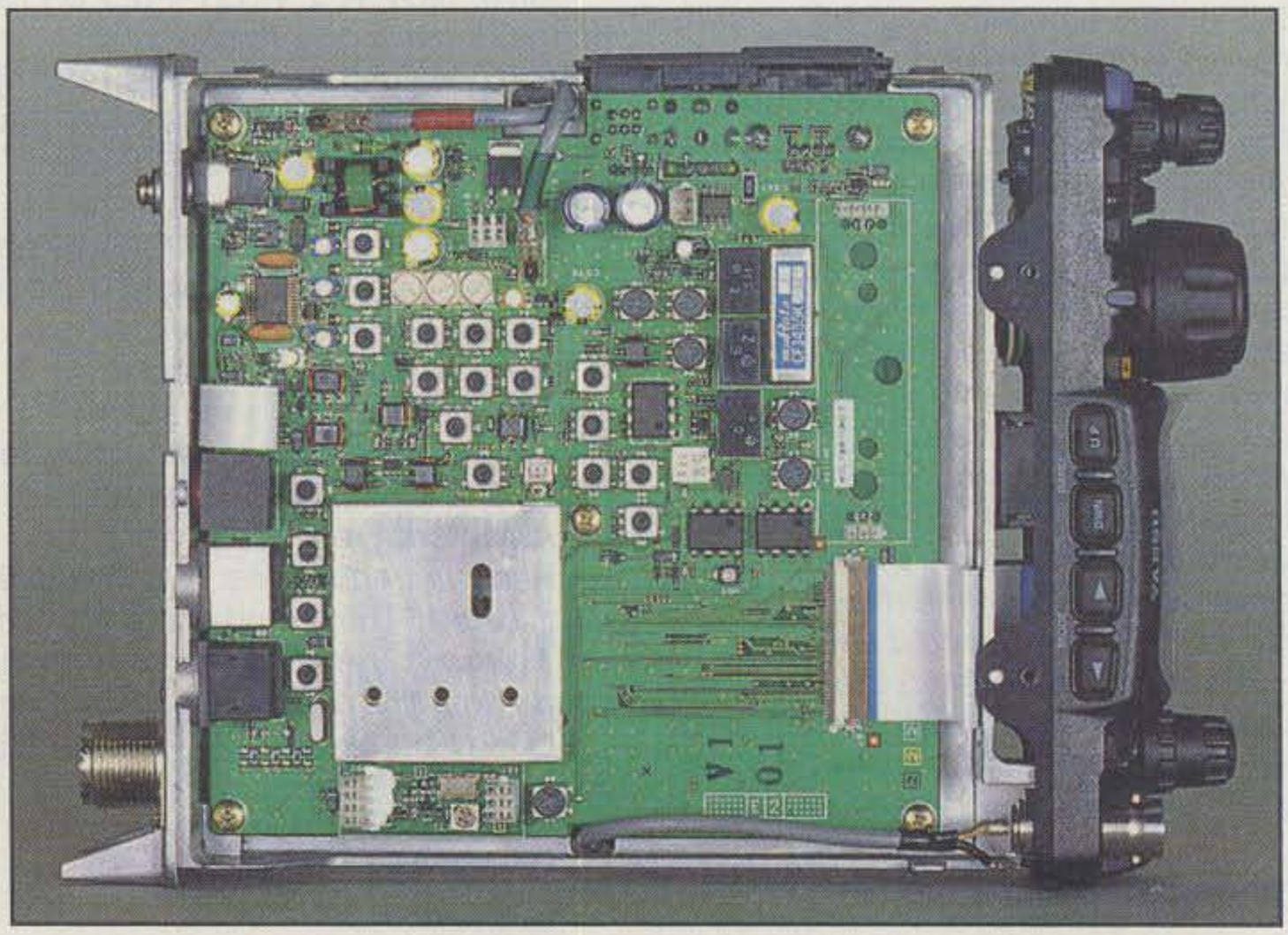
A Yaesu 9.6 V, 1 Ah rechargeable Ni-Cd battery pack is available. By default when using internal battery power, the rig switches to 2.5 W output, but it can be reset for 5.W, 1 W, or 500 mW. To obtain the full 5 watts output power, the FT-817 normally requires a 13.5 VDC external power supply. Installing eight light-weight AA lithium cells internally, however, accomplishes the same thing. Since lithium cells are expensive, I keep a set of lithium AAs handy only for emergencies. For routine portable operation, I use eight rechargeable NiMH batteries.[2] A backpacker setting out on a longer trip may opt to carry a 13.5 V external gel-cell battery and a small flexible solar panel to charge it. See Table I for examples of current drain during various activities while using an external 13.5 volt power supply. (All measurements were made using a 13.8 VDC power supply with the transceiver tuned to the 20 meter band using a simple ammeter with a 10 mA resolution. LCD illumination was amber. The optional Collins filter and high-stability module were not installed when the input current was measured. Power output values are nominal. They probably slightly exceed the values listed.)

The figures in the current-drain table illustrate that for best battery life the LCD display illumination should be turned off and the front antenna should be enabled. The difference between earphone and speaker use is not significant. That's good news for backpacking amateurs. Inside a tent or around camp or on the trail, listening with earphones is often less convenient than with a speaker.

The rear antenna connection is controlled by a non-latching relay, so as long as the rear antenna is enabled, its control relay must remain energized, consuming current for what should be a passive function. In practice, then, most portable operators probably will choose to connect all antennas, including those used for VHF and UHF, to the front antenna socket, preferably through a right-angle adapter to protect the antenna cable and to gain better access to the SEL control and the HOME and CLAR buttons. In order to reduce stress on the front BNC connector, a coaxial cable should be used for all but the smallest and most flexible antennas. Some separation between the antenna and the operator should improve efficiency and decrease operator exposure to non-ionizing radiation. Even at five watts, the RF exposure to a person touching or very close to the antenna is not trivial. Thus, if the supplied rubber duck is used while the operator is carrying the FT-817 by the shoulder strap, the power should be reduced to 1 W or 500 mW.

Operating the FT-817

Most settings of the FT-817 are controlled from the front and top. There is also a slide switch on the right side which selects the use of the audio output socket for earphones or for an external speaker. The rotating controls are



Top interior view of the FT-817. Note the extensions to the steel case to protect the rear connections. (WA6NGH photo)

SEL, a detented control for selecting menu settings and channelized tuning and memory selection, the main tuning knob, and two coaxial controls (The inner one is AF gain and the outer control combines squelch and RF gain.). On the top are the MODE left and right buttons. The top of the FT-817 also includes the BAND down and up buttons, which are duplicated by the down and up buttons on the MH-31 microphone. The microphone also has a central FAST button, which speeds the up-down functions. On the back of the microphone is a two-position slide switch which shifts the transmitted audio range somewhat. The left front button is HOME, and on the right front are F (Function), V/M (VFO/Memory), LOCK, and PWR buttons. In the lower left next to the SEL (Select) control is the CLAR (Clarifier) button. The A, B, and C push buttons are just below the display.

Many functions in the FT-817 are controlled through two menus:

The *Operating Menu* efficiently controls 33 different functions. These functions are used frequently for moment-to-moment control of the transceiver. To utilize the Operating Menu, the F button is held until one beep is heard, then the detented SEL control is rotated to one of 12 positions until the appropriate set of functions appears on the display above the A, B, and C buttons. Then one of these three buttons is either pushed or held in to change a menu parameter. With some practice, the process takes less time to accomplish than to describe.

The *Customizing Menu* controls 57 less-frequently used functions. Most are set-and-forget variables, so it doesn't matter that it often takes longer to execute changes on this menu. The Customizing Menu uses the F button, which is pushed until two tones are heard. Next the detented SEL button is rotated to select the desired menu item. Labels for these functions are arranged alphabetically. Then the variables are selected using the main DIAL. Finally, the F button is held for two beeps to store the new variable in non-volatile memory.

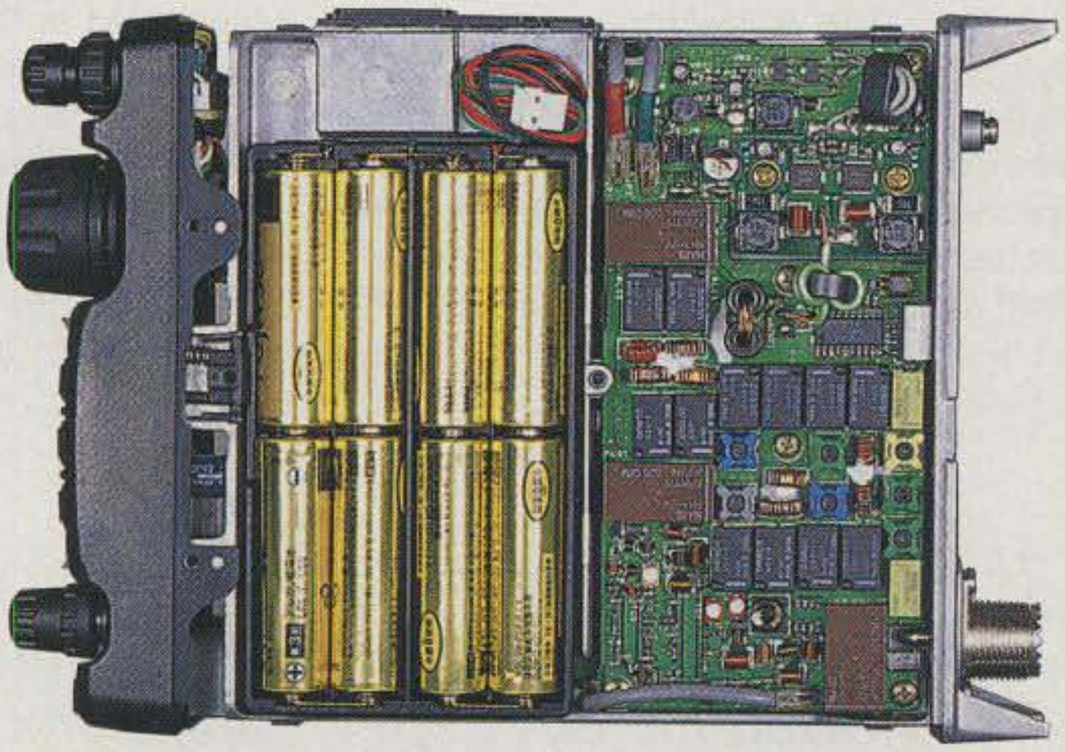
Golden Nuggets

Some features of the FT-817 are really special:

• The IF Shift feature in the FT-817 is seldom found on QRP rigs. The receiver stays on the same frequency, but the band-pass filtering can be moved up and down, making it a wonderful QRM fighter. The performance of the receiver for CW when combining the optional CW filter with the IF Shift is impressive. Once set, the IF Shift may be nullified, then quickly called up again to deal with periodic interference.

• Buried among the extended customizing menu item numbers 54 through 57 are parameters which function like fixed analog IF shifts for receive and transmit on LSB and USB. Some SSB operators prefer, for example, to listen permanently to a slightly shifted audio spectrum to decrease ambient atmospheric noise. When employing the regular IF Shift, the starting zero point would then simply be shifted. Similarly, operators with especially high- or low- pitched voices can improve the quality of their transmitted audio by making similar permanent spectrum shifts.

• The FT-817 is ready-made for digital modes such as AFSK RTTY, including Baudot and ASCII RTTY, AMTOR, numerous user-defined modes, and the increasingly-popular PSK31, PSK63F, MFSK16, and MFSK8, which take advantage of a computer sound card to allow for narrow-bandwidth keyboard communication. Some operators who would never be caught carrying a backpack may want to buy the FT-817 principally to be able to operate the new digital modes on many different bands.



Bottom interior view of the FT-817. Yaesu offers a nickel-cadmium battery pack and a case for AA alkaline batteries. External 13.8 volt DC power is also supported. (WA6NGH photo)

• The S-meter supplements an LCD bar-graph with actual S-unit numbers. If the ALC is registering an S-5, the LCD says S5, followed by four bar-graph symbols. You don't even have to think hard to give a proper signal strength report. You just read the number.

• The 200 memories can be partitioned into ten groups of up to 20 memories each. For example, group "a" consists of memories 001–020, "b" holds memories 021–040, etc. This is a great way of managing such a large number of memories. If an operator carefully plans the allocation of those memories, memory navigation is greatly simplified.

• The current frequency or channel name can be displayed optionally in large letters, a big advantage in portable and difficult-lighting situations.

• The A, B, and C buttons which control the operating menu can be pushed successively, even when the item names are not displayed. That means, for example, that VFOa and VFOb frequencies can be switched and restored with just two presses of button A. Similarly, the four different output power levels can be changed with one to three presses of the same button at a different menu row. Once mastered, then, the operating menu can be manipulated very efficiently.

• The MH-31 microphone is detachable from its coiled cord, allowing easy installation of a headset or a desk mic. Since the FT-817 is VOX-capable, a headset would allow for hands-free phone operation.

• A really helpful feature for portable operation is the option to display the B+ input voltage with 0.1 V resolution. That way an operator can monitor battery health without carrying extra gear.

• Since the FT-817 is so portable, the Smart Search™ function allows an operator in a brand-new location to perform a quick census of locally-active AM or FM frequencies on a given band. The active stations are recorded in a temporary memory bank for instant use.

• CW operators like the flexibility of changing the CW sidetone, which automatically tracks with the CW offset. Pressing and holding the HOME key yields an off-air offset tone for matching with a received signal to accomplish a convenient zero-beat. The CW sidetone and CW offset also match volume, which can be regulated through the customizing menu.

• Another enhancement of this portable rig is the Auto-Range Transpond System (ARTS™), which allows a team of amateurs participating in a public-service event or a search- and-rescue operation to flag their within-range status automatically to a control station. That way the field team can concentrate on field operations, while the control station can receive fresh reports of which field stations can be contacted every ten minutes.

• The FT-817 can be set to function as an off-air code-practice oscillator using a straight key or a bug or the internal iambic keyer. The feature can be combined with listening to CW transmissions over the air.

• Computer-control interface circuitry is built into the FT-817 and software is available.

The Antenna Situation

For routine operation on 50, 144, and 440 MHz, the FT-817 is a self-contained station using its rubber-duck antenna.

The Yaesu FT-817 gives a whole new meaning to operating portable. WA6NGH recently visited Vertex-Standard's Headquarters in Tokyo and interviewed the developers of this unique rig for CQ.

The Development of the Yaesu FT-817 An Exclusive *CQ* Interview

BY SAM VIGIL,* WA6NGH

We hams sometimes take our radios for granted, rarely thinking about the work that went into designing and building them. CQ contributor Sam Vigil, WA6NGH, recently visited Japan and we asked him to see if he could work a couple of visits to ham manufacturers into his schedule. After thinking about 3 milliseconds, he agreed. We thank Vertex Standard and its officials, both in Japan and the US, for their cooperation and assistance. — W2VU

The idea for the FT-817 was conceived more than six years ago. Yaesu envisioned a go-anywhere, do-anything transceiver that could be used by hams on the go. In Japan's crowded cities, most hams live in apartment buildings and have the same difficulties in setting up antenna systems that many of us do in the US. Their proposed go-anywhere transceiver could be used mobile or hand held and turn even an afternoon picnic into an operating opportunity. The vision behind the concept was to build a transceiver that was not constrained to traditional settings.

Due to the press of other projects, the concept lay dormant until the 1998 Dayton Hamvention®, when the decision was made to go ahead with the project. At this point, several key specifications for the rig were developed. The radio had to be: (1) lightweight; (2) all mode: CW, SSB, AM, FM; (3) multiband: HF/VHF/ UHF; (4) able to operate on internal batteries; and (5) a no-compromise, full-feature design.

Turning a Concept Into a Radio

With these five basic parameters as their guide, the Yaesu design team went to work. Here's a look at how they met and exceeded all of the specifications of the original concept:

1. Lightweight: The first thing that you notice about the rig is its small size, light weight, and rugged nature. With AA or Ni-Cd cells installed the rig weighs 1.17 kg (2.58 lbs), but it has the feel of a rig that can really survive in a backpack.

2. All mode: The rig can run CW, SSB, AM, FM, and common digital modes such as VHF and HF packet, PSK-31, and RTTY (an external TNC or sound-card-equipped PC required).

3. Multiband: The rig has both HF and VHF/ UHF capabilities (160–10 meters, 6 meters, 2 meters, 70 cm, and the 5.1675 MHz Alaska Emergency Frequency). Although there are several other competing HF QRP rigs on the market, the multi-mode VHF/UHF capabilities of the FT-817 are unique for a rig this small.

4. Internal batteries: Two internal battery packs are supported: the supplied FBA-28 AA alkaline battery case, 8 cells, 12.0 VDC; and the optional FNB-72 Ni-Cd battery pack, 9.6 VDC. With either battery pack installed the output power is automatically reduced to 2.5 watts as a default (can be overridden to 5.0 watts). An external 13.8 VDC supply is recommended for 5.0 watt output. The Ni-Cd battery pack can be recharged while in the rig with an external optional charger, the NC-72B/C/U, or by connecting an external 3 amp 13.8 VDC power supply. The FT-817 uses 170 mA for an 8-hour charge, controlled by a built-in timer. After 8 hours the charging rate is reduced to a 15 mA trickle charge.

5. No-compromise, full-feature design: The rig was designed to have all of the features hams have come to expect in a modern rig. N7RR's review covers these features in detail.

The Competition

The QRP segment of ham radio is healthy, with a number of innovative rigs available both in kit and assembled form. The two HF SSB QRP rigs most comparable to the Yaesu FT-817 are the SGC 2020 and the Elecraft K2. All three rigs have their strengths. A unique feature of the FT-817 is that it covers both HF and VHF/ UHF bands in one compact unit without the use of external transverters. For the QRP operator primarily interested in HF, this may not be an issue. The SGC 2020 has received good reviews for its ruggedness and SSB performance. The K2 has developed a devoted following, both for its performance features, especially for CW operations, and the kit-building experience. Portable QRP operators truly have the "rich man's problem"—trying to choose among three great rigs!

Beyond QRP

While the FT-817 was designed as a low-power radio, Yaesu feels it will have wide appeal beyond the traditional QRP community. The ability to operate anywhere, anytime, any mode will be a strong inducement for many hams—including business travelers, satellite operators, emergency communicators, and others—to use the rig . Yaesu believes hams will use their own ingenuity to enhance the FT-817 with portable antennas, solar-panel arrays, and other accessories. Indeed, that is already happening, as you can see from the extensive list N7RR prepared of third-party manufacturers who have already made available a wide number of accessories for the 817.

Yaesu believes the FT-817 will make "go-anywhere" operation more available to a wider range of hams than ever before, and that the ability to operate on the spur of the moment on a business or vacation trip will add a whole new dimension to amateur radio.

For more information on this breakthrough radio, read the accompanying review and see Yaesu's FT-817 website at <http://www.yaesu.com/amateur/ft817tx.html>.

	Price	Weight
FT-817 transceiver with all standard accessories: rubber ducky antenna, carrying strap, power cord, microphone, plus 8 alkaline AA cells	$770	2.81 lbs., 1.275 kg base weight without accessories: 2.06 lbs., 935 g
YF-122S 2.3 kHz 10-pole Collins SSB filter or	$150	0.25 oz., 7 g
YF-122C 500-Hz 7-pole Collins CW filter	$150	0.35 oz., 10 g
FNB-72 9.6-V 1 Ah Ni-Cd battery pack	$60	6.2 oz., 176 g
NC-72B Ni-Cd wall charger	$20	1 lb., 454 g
TCXO9 0.5 PPM high-stability module	$90	0.2 oz., 6 g
MH36E8J DTMF hand microphone	$55	5.5 oz., 156 g
MD-100$_{A8X}$ deluxe desk microphone	$125	24.6 oz., 670 g
CT-39A data cable	$10	2.0 oz., 50 g
CT-62 CAT interface cable	$30	2.3 oz., 60 g
FT-817 transceiver with all portable options installed	$1205	3.23 lbs., 1.467 kg

Table II– Price and weight details of the FT-817.

More advanced operation such as mountain-topping and satellite communication requires more efficient antennas. External antennas are required for the amateur bands below 30 MHz. Backpackers who are content to operate on a single band require only a simple dipole. A 40 meter half-wavelength dipole can be used directly on both 7 and 21 MHz. In order to take advantage of the multiband capability of the FT-817, however, the operator must either fill the backpack with assorted wire antennas, or use a portable multiband antenna such as an alligator clip-linked multiple dipole, an inductive-loaded vertical such as an Outbacker OB8TRI or a Super Antennas PW-1^3, or carry just one wire antenna plus a portable external antenna tuner. Whatever option is used, the total weight of a fully-functioning FT-817 station probably will be five pounds or more.

Because of changing effects of the operator's body motion, short vertical antennas mounted on a backpack exhibit quite unstable impedance. Therefore, for true pedestrian mobile operation a means of continuous impedance adjustment is necessary, such as the LDG Electronics Z-11 tuner in the AUTO mode.

Wish List

Is there room to improve on the FT-817? Sure, although it seems absurd to complain about things that are missing from this transceiver, which is already stuffed with a very impressive array of features. Nevertheless, here is my wish list:

• The most important feature lacking in the FT-817 is a built-in automatic antenna tuner. Such a tuner would make the rig even more versatile for mobile and portable use.

• Backpackers are especially concerned about current drain, and some correctable aspects of the FT-817 add to its current-drain requirements. First, the design should employ control circuitry which "goes to sleep" once a given control function has been implemented. Second, all of the relays in the transceiver, except the one used for transmit-receive switching, should be the latching type so that no extra current is consumed to keep them in place. The most important relay replacement is for the rear antenna connector. As presently configured, using the rear antenna socket requires about 20 to 30 mA more current than the front antenna socket. In many portable operating situations the rear antenna socket is more convenient than the front one. There should be no current drain penalty for using either antenna socket.

• I would prefer that the positions of the PWR and F buttons be reversed. The frequently-used F button, nestled close to the tuning control, is tricky to push without moving the tuning control. The PWR button, on the other hand, is too exposed near the right front corner of the rig, making the FT-817 vulnerable to being accidentally turned on or off while inside a backpack.

• The FT-817 has RIT (receive incremental tuning), but no XIT (transmit incremental tuning). The dual VFO can be used to operate split, so much of the operational equivalent of an XIT is available, but it takes some quick menu manipulation to accomplish, so it is not as convenient as a straightforward XIT.

• The FT-817 has no hands-free "tune" function. That makes it awkward and more time-consuming to employ a manual antenna tuner, which is tuned most efficiently with two hands. For base-station operation, this deficit can

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3CX2500A3	4CX250B & R	4CX10000D	3-500ZG
3CX2500F3	4CX350A & C	4CX15000A	3-1000Z
3CX2500H3	4CX400A	4CX20000A7	4-125A
3CX3000A7	4CX800A	5CX1500A & B	4-250A
3CX3000F7	4CX1000A	572B	4-400C
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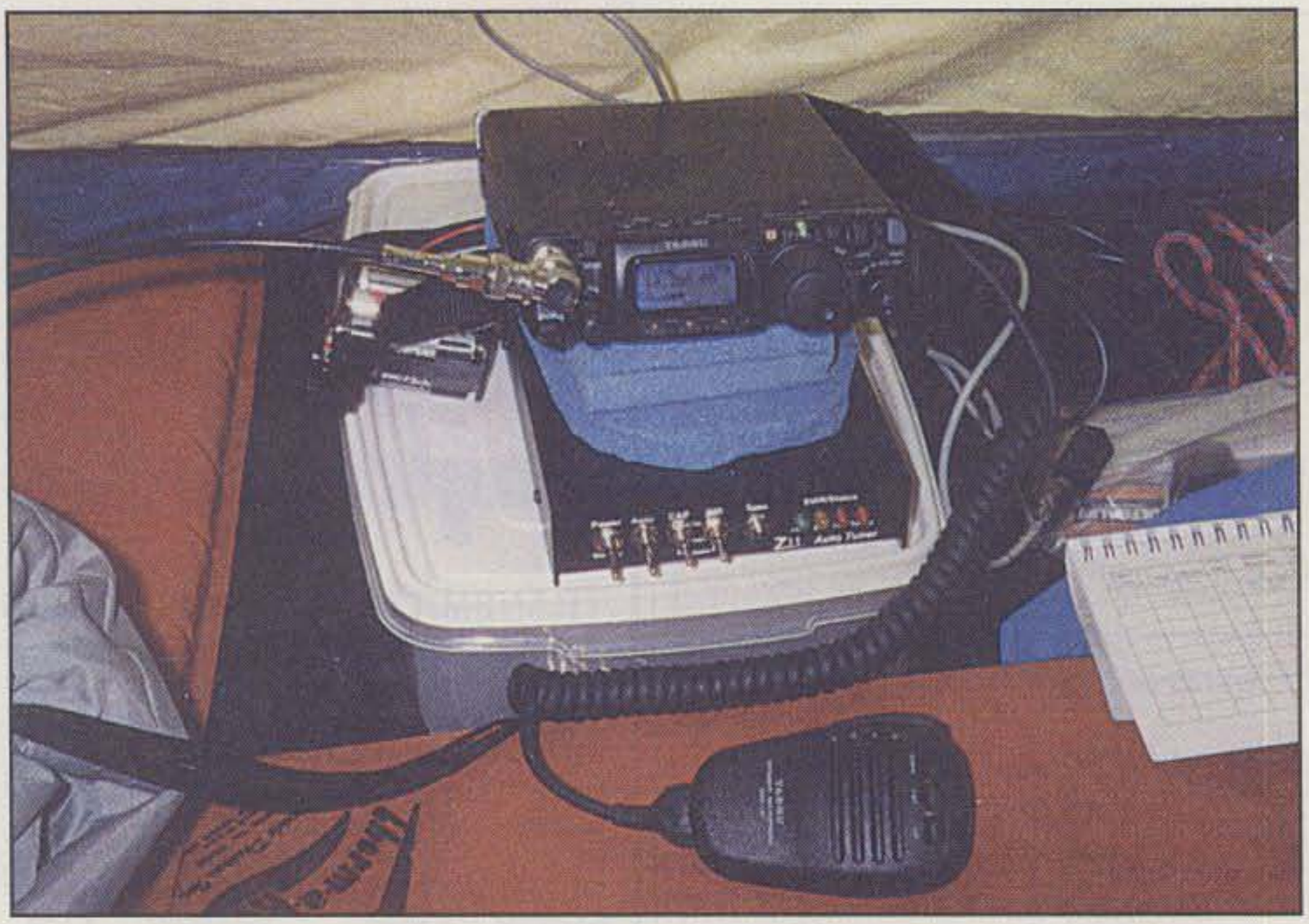

An antenna tuner makes portable multiband operation practical.

Margaret Prior, KD7CEL, combines snowshoeing with 10 meter SSB.

The shoulder strap makes FT-817 portable operation easy. Yes, there is an antenna connected—via the front-panel connector.

be fixed by employing an external CW keyer which includes a tune function. In the field, the rig will send a carrier in CW or CWR mode by inserting a shorting mini-plug (often used to erase cassette tapes) into the key jack. Vertex Standard could fix this oversight by programming the C key on the twelfth row of the programming menu as a press-and-hold "tune" command.

• Although cross-band operation makes satellite communications possible with the FT-817, it would be more convenient with cross-band full-duplex capability.

• No notch filter is available to null out carriers, although their interference can often be reduced using the IF Shift function and an optional Collins mechanical filter.

• The very useful display backlight AUTO function works only when internal batteries are in use. There are occasions when an external battery is employed and this energy-saving feature would also be helpful.

• There is no internal provision for an audio enunciator. Although manufacturers often think of audio enunciators as a facility for visually-impaired operators (a significant amateur radio group), they are also very useful to any operator in low-light conditions, such as in a tent at night. An audio enunciator should be offered as an option which, by pressing and holding the LOCK button, conveys the LCD display information as a Morse sidetone at the same speed at which the iambic keyer CW SPEED is set.

• So far, Vertex Standard has not offered an optional mobile mounting bracket. The company is clearly not marketing the FT-817 as a mobile rig, but it would make a fine around-town 2 m/70 cm motor-vehicle rig which just happens to also include all amateur bands from 160 to 6 meters.

• Perhaps because the 222 to 225 MHz spectrum is not available to amateurs in Japan, that amateur band is not included in the FT-817 on transmit or receive.

• North American outdoor enthusiasts could use 162 MHz weather station receive capability. That part of the spectrum was omitted to reduce the vulnerability of the receiver to interference from paging services.

• In the present configuration, the AF control interferes with the rotation of the DIAL tuning control. If the SEL and AF-SQL/RF controls were reversed, then the SEL control could be shorter, eliminating the problem. This is a small matter, however, since there is a good way to work around it: Set the STEP interval to a minimum value, say 1 kHz for CW and SSB, and then to use the detented SEL control to move up and down the band, then to rotate the DIAL only for fine-tuning adjustments.

• CW operators would appreciate CW message memories. The two MODE buttons and the two BAND buttons could be retained as they now exist, but

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reprogrammed so that pressing and holding each button would send one of four stored CW memories. Storing the four memories could be accomplished by pressing and holding the STO function button and then pressing the appropriate top button.

• The FT-817 is so small that it would help to elevate it a bit if operating on a desk for the best view of the display. A tilt-bail or other tilting mechanism would be a useful addition, but it would add weight. An ideal solution would be to offer an easily-removable titanium tilt-bail as an option. The tilt-bail could be mounted on modified carrying strap brackets.

• Since SSB-based digital modes such as MFSK16 routinely use LSB for 40 meters and below and USB for 30 meters and above, the PSK31-L and PSK31-U settings in operating menu 26 (DIG MODE) should apply to individual memories rather than system-wide. With the current firmware programming, a digital operator must remember to switch that parameter when changing to and from the lower bands.

The Secondary Market

Several products by other manufacturers enhance the enjoyment of the FT-817. This appears to be only the beginning of a parade. Only the *Vade Mecum* quick-reference cards have been evaluated for suitability by Vertex Standard. See the Secondary FT-817 Products listing (Table III) for details.

A New Approach to Amateur Radio

The FT-817 represents a paradigm shift in amateur transceivers. It is a radio that is attractive to amateurs who never thought of themselves as QRPers. It also changes the equation for QRP radios. Never again can a QRP transceiver manufacturer neglect the opportunities which surface-mount and robotic assembly technologies offer for miniaturization. Any big home-station rig can be throttled back to QRP levels, but a purpose-built QRP rig from now on must not only be full of useful features, it must be small and lightweight as well.

There is nothing ho-hum about this radio. It's the sort of product that is already generating a lot of creativity in the user community. The radical portability of the FT-817 has taught us to pay special attention to portable broadband antenna design. Digital operators are scheming about ways to operate from mountains and deserts and tall forests. We can operate through satellites using hand-held antennas, then switch to HF operation using the same rig. Amateurs who have never tried low power before are delighted with what they can accomplish. No question. Vertex Standard has thrown down the gauntlet.

Footnotes

1. See the Secondary FT-817 Products listing (Table III) for alternative bandpass filters. The 10-pole filter specification in some Yaesu advertisements actually applies to the YF-122S SSB filter rather than to the 7-pole YF-122C CW filter.

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S-1340	40MHz	Dual Trace	$475
S-1345	40MHz	Delayed Sweep	$569
S-1360	60MHz	Delayed Sweep	$725
S-1390	100MHz	Delayed Sweep	$895

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DS-603	60MHz/20Ms/s Analog/Digital	$950

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Elenco Model MX-9300B
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Features:
• One instrument with four test and measuring systems:
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Electronically controlled, ideal for professionals, students, and hobbyists. Available in kit form or assembled.
Works w/ any iron! Turn any soldering iron into a variable iron.
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• Sponge Pad.

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Model SL-5 - No iron. (Kit SL-5K) $29.95
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This hi-tech soldering station incorporates a sophisticated electronic circuit which enables the user to change the tip temperature from 300°F (150°C) to 900°F (480°C). The temperature is maintained within +10°F of its preset temperature. The tip is isolated from the AC line by a 24V transformer. The tip is grounded to eliminate static charges.

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Model AR-2N6K
$34.95
2 Meter / 6 Meter Amateur Radio Kit

Model AM-780K
$11.95
2 IC Radio Kit

Model M-1005K
Digital Multimeter Kit
$19.95
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• 3 1/2 Digit LCD
• Transistor Test
• Diode Test

Model RCC-7K
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$29.95
7 Functions

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Elenco Model XK-150
$89.95
Features:
Digital Section: 8 data switches, 2 no-bounce logic switches, 8 LED readouts (buffered), clock frequency 1Hz, 1kHz, 100kHz, 60Hz.
Analog Section: Function generator (sine, square wave), frequency adjustable in two ranges from 200 - 40k, amplitude sine 4Vpp, square 12Vpp.
Power Supplies: Variable power supply, +1.25V to 15VDC @ 0.25A, -1.25V to -15VDC @ 25A, +5VDC @ 0.25A, +30VAC center-tapped at 15VAC @ 0.25A.
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Kingsmith Software www.kingsmith-software.com	RATS FT-817 computer control software	check website	N/A
International Radio, 136 Tyee Road, Umpqua, OR 97486 (541-459-5623) www.qth.com/inrad/	Collins 7-pole mech. filter, 300 Hz 500 Hz Collins 8-pole mech. filter, 2.6 kHz, 5.8 kHz Collins 10-pole mech. filter, 2.4 kHz, 2.7 kHz	$125 $125 $175	0.25 oz., 7 g 0.30 oz., 9 g 0.35 oz., 10 g
Cutting Edge Enterprises 1803 Mission Street, Suite 546 Santa Cruz, CA 95060 (831-429-5384) www.powerportstore.com	Padded FT-817 pouch and nylon fanny belt 2.3 Ah power kit plus charger	$74 $60	TBA 24 oz., 680 g
The Pouch Company www.thepouch.com available only through amateur radio retailers	FT-817 PackerPOUCH	$25	3.1 oz. 88 g
Kairos Research, 853 Alder Street, Blaine, WA 98230 (360-332-6046)	FT-817 Vade Mecums, a set of two laminated double-sided quick reference cards	$6.00 + $1.00 shipping (+ tax for WA) to Canada, US, Mexico, or $3.00 shipping elsewhere	0.5 oz. 15 g
RadioShack www.radioshack.com	8@ 1.6 Ah NiMH AA cells	$36	5.3 oz.,150 g
Mr. NiCd's Batteries America, 2211-D Parview Road, Middleton, WI 53562 (800-308-4805, fax 608-831-1082) www.batteriesamerica.com	9.6 V 1.65 Ah NiMH internal battery pack 8@ 1.2 V 1.6 Ah NiMH AA cells	$50 $24	7.6 oz., 216 g 7.4 oz., 210 g
Maha Energy Corporation, 545-C West Lambert Road, Brea, CA 92821 (1-800-376-9992 or 714-990-4557, fax 714-990-1325)	MH-FMB-72 9.6 V 1.7 Ah NiMH internal battery pack and cable for MH-777 quick charger 8@ 1.2 V 1.7 Ah NiMH AA cells	$60 $32	7.5 oz., 213 g 7.4 oz., 210 g
Electronicsusa.com 14270 Apple Creek Dr., Victorville, CA 92392-4655 (760-241-5775) www.electronicsusa.com	Whiterook MK-44 iambic mini-paddle mini-key leg mount	$19.90 inc. s&h $10.45	1.2 oz., 34 g 0.9 oz., 26 g
General Business Software, 2 So. 872 Wagner Rd., Batavia, IL 60510 (toll-free 877-227-9139, fax 630-377-9526) www.amateurradioproducts.com	magnetic base BullDog iambic MiniKey	$32.45 incl. s & h	1.4 oz., 40 g
Paddlette Co., PO Box 6036, Edmonds, WA 98026 (425-743-1429)	BP backpacker magnetic iambic paddle key KM-1 knee mount KP-4 key and keyer combo	$45.50 $11.00 $90.00	1.0 oz., 28 g 1.0 oz., 28 g 1.7 oz., 48 g
Alpha Delta Communications, Inc., PO Box 620, Manchester, KY 40962 (606-598-2029, toll-free order line 888-302-8777) www.alphadeltacom.com	OB8TRI 80–10 m portable Outbacker antenna	$335 inc. US shipping	1 lb. 11.7 oz., 785 g
Super Antennas, 1606 Pheasant Way, Placerville, CA 95667 (530-622-6668) www.superantennas.com	PW-1 40–10 m portable antenna	$160 inc. s&h with telescopic whip	1 lb. 3.6 oz., 840 g 1 lb. 14.3 oz., 860 g with sectioned whip
LDG Electronics, 1445 Parran Road, PO Box 48, St. Leonard, MD 20688 (410-586-2177, fax 410-586-8475) www.ldgelectronics.com	Z-11 Auto Tuner for 100 mW ~ 30 W	parts kit $119 parts kit plus enclosure $145 assembled and tested $179	4.2 oz., 119 g 15 oz., 425 g 15 oz., 425 g
Emtech, 1127 Poindexter Ave. W, Bremerton, WA 98313 (360-405-6805) www.emtech.steadynet.com	ZM-2 manual ATU with LED tune indicator for up to 15 W	$50 inc. shipping to cont. US	7.9 oz. 223 g
Doug Hendricks, 862 Frank Ave. Dos Palos, CA 93620	NorCal 5-W Balanced Line Tuner (BLT) Kit	$25 + $4 s&h	5.7 oz. 162 g

Table III– Secondary FT-817 products.

Maha, Mr. NiCd's, and RadioShack. See Table III.

3. See Table III. Those short antennas work best when the ground side is capacitively coupled to the earth. Think of the counterpoise part of these antennas as half of a capacitor, the other half of which is the earth. That's how motor vehicles function for mobile antennas. A 3 inch by 9 foot length of heavy-gauge copper foil is a good counterpoise choice for hikers, even though it looks a bit strange to trailmates! A sheet of kitchen aluminum foil will also do the trick. I've attached a wire with an alligator clip to the FT-817 ground screw. That way I can connect the rig to the earth ground system in my home station, and in the field I can couple it to any metal object that's handy: a barbed-wire fence, the heavy-gauge aluminum-foil windscreen for my camp stove, a trekking pole, crampons, ice axe, metal tent poles, etc. ■

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MODEL SS-18

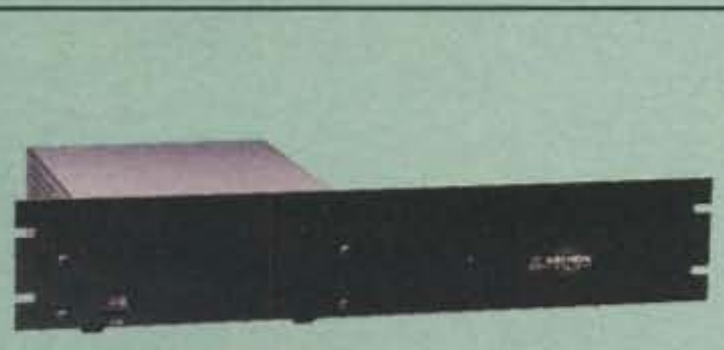
DESKTOP SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-10	7	10	1⅛ x 6 x 9	3.2
SS-12	10	12	1⅛ x 6 x 9	3.4
SS-18	15	18	1⅛ x 6 x 9	3.6
SS-25	20	25	2⅞ x 7 x 9⅝	4.2
SS-30	25	30	3⅜ x 7 x 9⅝	5.0

MODEL SS-25M

DESKTOP SWITCHING POWER SUPPLIES WITH VOLT AND AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-25M*	20	25	2⅞ x 7 x 9⅝	4.2
SS-30M*	25	30	3⅜ x 7 x 9⅝	5.0



MODEL SRM-30

RACKMOUNT SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25	20	25	3½ x 19 x 9⅛	6.5
SRM-30	25	30	3½ x 19 x 9⅛	7.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M	20	25	3½ x 19 x 9⅛	6.5
SRM-30M	25	30	3½ x 19 x 9⅛	7.0

MODEL SRM-30M-2

2 ea SWITCHING POWER SUPPLIES ON ONE RACK PANEL

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25-2	20	25	3½ x 19 x 9⅛	10.5
SRM-30-2	25	30	3½ x 19 x 9⅛	11.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M-2	20	25	3½ x 19 x 9⅛	10.5
SRM-30M-2	25	30	3½ x 19 x 9⅛	11.0

MODEL SS-12SM/GTX

MODEL SS-10EFJ-98

CUSTOM POWER SUPPLIES FOR RADIOS BELOW

EF JOHNSON AVENGER GX-MC41
EF JOHNSON AVENGER GX-MC42
EF JOHNSON GT-ML81
EF JOHNSON GT-ML83
EF JOHNSON 9800 SERIES
GE MARC SERIES
GE MONOGRAM SERIES & MAXON SM-4000 SERIES
ICOM IC-F11020 & IC-F2020
KENWOOD TK760, 762, 840, 860, 940, 941
KENWOOD TK760H, 762H
MOTOROLA LOW POWER SM50, SM120, & GTX
MOTOROLA HIGH POWER SM50, SM120, & GTX
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
UNIDEN SMH1525, SMU4525
VERTEX — FTL-1011, FT-1011, FT-2011, FT-7011

CIRCLE 134 ON READER SERVICE CARD

NEW SWITCHING MODELS

SS-10GX, SS-12GX
SS-18GX
SS-12EFJ
SS-18EFJ
SS-10-EFJ-98, SS-12-EFJ-98, SS-18-EFJ-98
SS-12MC
SS-10MG, SS-12MG
SS-101F, SS-121F
SS-10TK
SS-12TK OR SS-18TK
SS-10SM/GTX
SS-10SM/GTX, SS-12SM/GTX, SS-18SM/GTX
SS-10RA
SS-12RA
SS-18RA
SS-10SMU, SS-12SMU, SS-18SMU
SS-10V, SS-12V, SS-18V

*ICS – Intermittent Communication Service

For years amateur operators and other users of the HF bands have decried the general decline in respect for international agreements governing the use of the radio spectrum. Pirates, "freebanders," and amateur "police" abound. Now at least one administration, the U.S., is turning up the heat on these scofflaws.

New HF-Angle, Single-Site Emission-Locator (HASSEL) Stations Ready to Cleanse Ham Bands

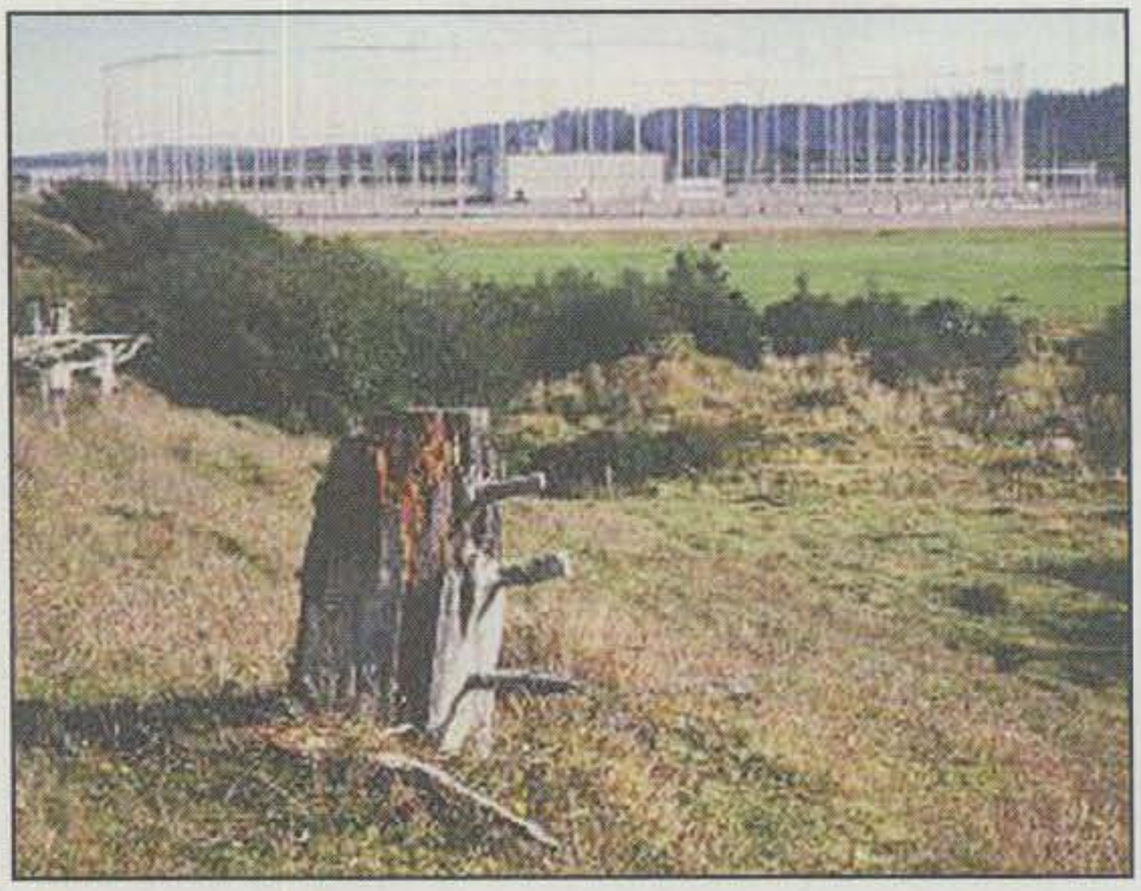
BY PROFESSOR EMIL HEISSELUFT*
LAUTON INSTITUTE, GROSSMAUL AN DER DONAU, AUSTRIA
e-mail: <heisseluft.emil@mashuga.orf.ar>

One doesn't have to listen to the amateur bands for too long these days to find examples of poor operating practices on the part of some licensed (and unlicensed) operators. From the "DX police" who seem all too eager to pounce on operators who inadvertently call on the DX station's transmit frequency to those who play music in the DX window on the 75 meter band, it appears that the general lack of self-control and consideration for others so prevalent in society today typifies even some members of the amateur fraternity. In the past, amateurs could do little about these miscreants. Now, however, using the most advanced technology available, the FCC is about to lower the boom and put them off the air—permanently! —ed.

Dear readers...it is time to let you in on a secret! Recently I have been working with your Federal Communications Commission (FCC) and the University of Leeds, United Kingdom, on a very sensitive project on the development and installation of a new generation of high-frequency (HF) direction-finding (DF) equipment. The technology is based on some new technology developed by Drs. H. J. Strangeways and S.M. Sow of Leeds,[1] and it employs their newest two-angle single- site emission locator (TASSEL) program. This technology represents an unprecedented leap forward in HFDF technology, and with its incorporation by the FCC in so-called "HF-Angle Single-Site Emission-Locator" (HASSEL) systems around the United States, the days of those who would scoff at your communications laws are numbered.

Older HFDF Technology

The use of bearings taken on HF and higher frequency radio signals is a well-known technique for locating the signal source. Using two well-separated HFDF sites, each employing narrow-aperture antennas, it is theoretically possible to locate a sought-after transmitter's location at the intersection of the beam headings observed. This technique has been used since before World War II, and it evolved into a fine art during the Cold War, when the Navies of both the United States and the (former) Soviet Union, among others, used such techniques to locate combatants at sea. So advanced were the techniques they used that it was possible to accurately locate ships using only short-duration (0.1-1 s) HF skywave signals. Thus, even the accidental, momentary keying of a microphone could compromise a mission!



The Canadian Forces HFDF antenna at Masset has an outer diameter of 260 meters (853 feet).

The antennas used by the U.S. Navy, and probably the Soviet Navy, were large Wullunweber arrays produced in Europe. *(Wullunweber arrays and other antennas of this type are known as Circular Disposed Antenna Arrays. —ed.)* These antennas provide the narrow apertures required for strategic and tactical military operations. A single "Wullunweber-type" installation, however, requires an extensive amount of land. To get some idea of just how large these antennas are, see the accompanying photo of the Canadian Forces Station Masset on the north coast of Graham Island

**Professor Heisseluft currently is assisting the FCC with the installation of the sixth HASSEL site in a remote desert area of Nevada. Correspondence may conveniently be directed to the professor c/o* CQ.

in British Columbia's Queen Charlotte Islands. This giant circular disposed antenna array has at its center a *two-story operations building* that is over 40 meters (131 feet) square. It is in this building that the intercept operators work.

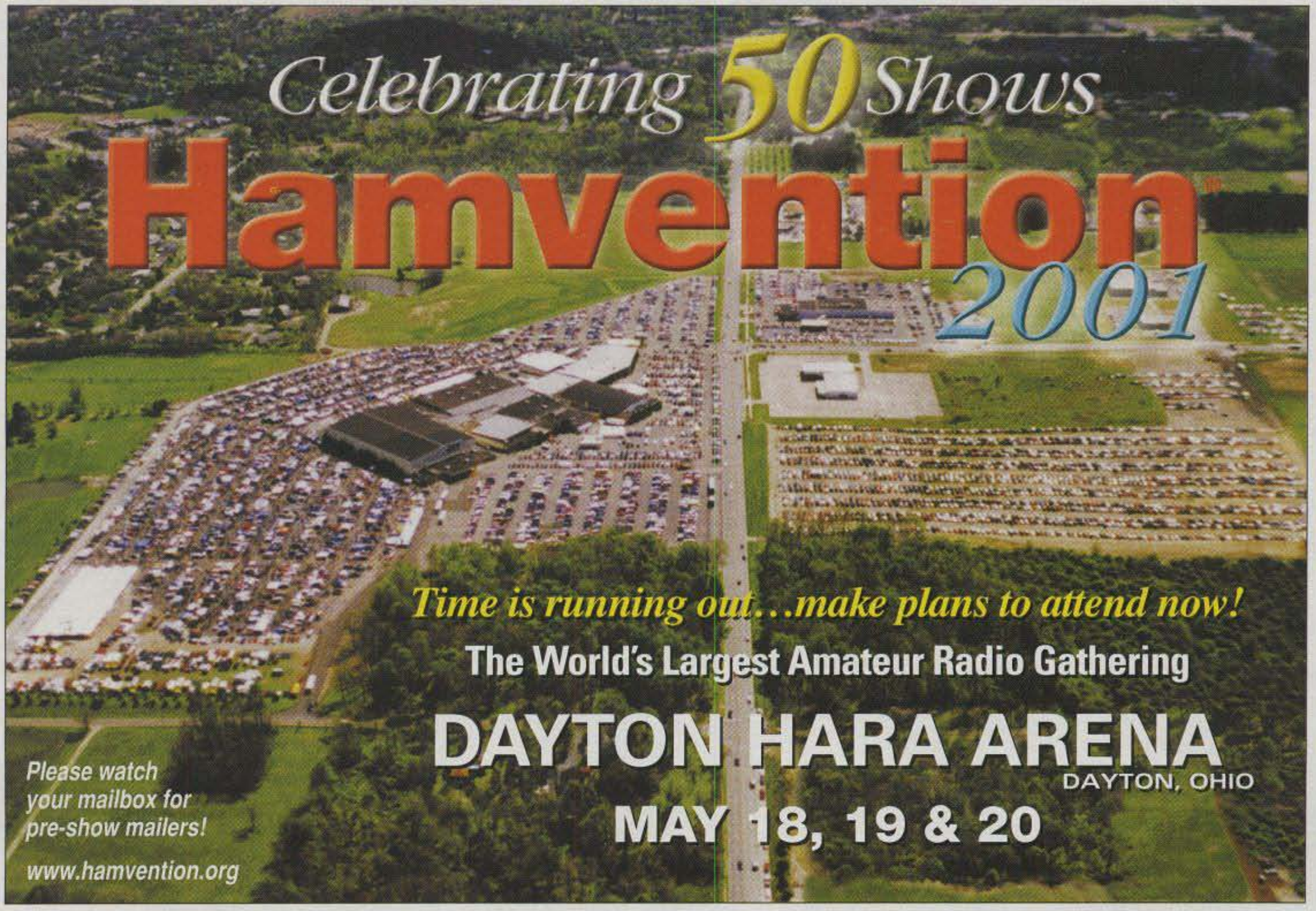
As described by the Canadian Forces: "Surrounding this building are two rings of HF antennae, one for shorter HF wavelengths, containing 120 sleeve monopoles, and one for longer HF wavelengths, containing 40 folded dipoles. The shorter wavelength ring is about 260 metres in diameter and the longer wavelength ring is about 230 metres in diameter. Inside each ring is a large wire screen supported by 80 towers, designed to prevent HF signals from crossing the array and interfering with its operations. The inner screen, corresponding to the longer HF wavelengths, is roughly 36 metres high. A horizontal ground screen about 390 metres in diameter surrounds the entire site. Overall, these enormous arrays look something like giant cages; for this reason they have sometimes been dubbed 'elephant cages.' The Masset installation has a 'nominal range' of 3200 nautical miles." *(To learn more about this installation visit <http://archive.uwaterloo.ca/~brobinso/masset.html>—ed.)*

Besides the large amount of land required for the installation, there were other problems to address as well, including large instantaneous bearing errors caused by phase and amplitude distortions of the wavefront. These distortions resulted from scattering and multipath interference. Sheppard,[2] for example, showed (using the Southwest Research Institute Coaxial Spaced Loop HFDF system) "...that for a limited sample of data from this system the standard deviation of the bearing estimate for a 200 ms signal varied from 15 to 59 degrees."

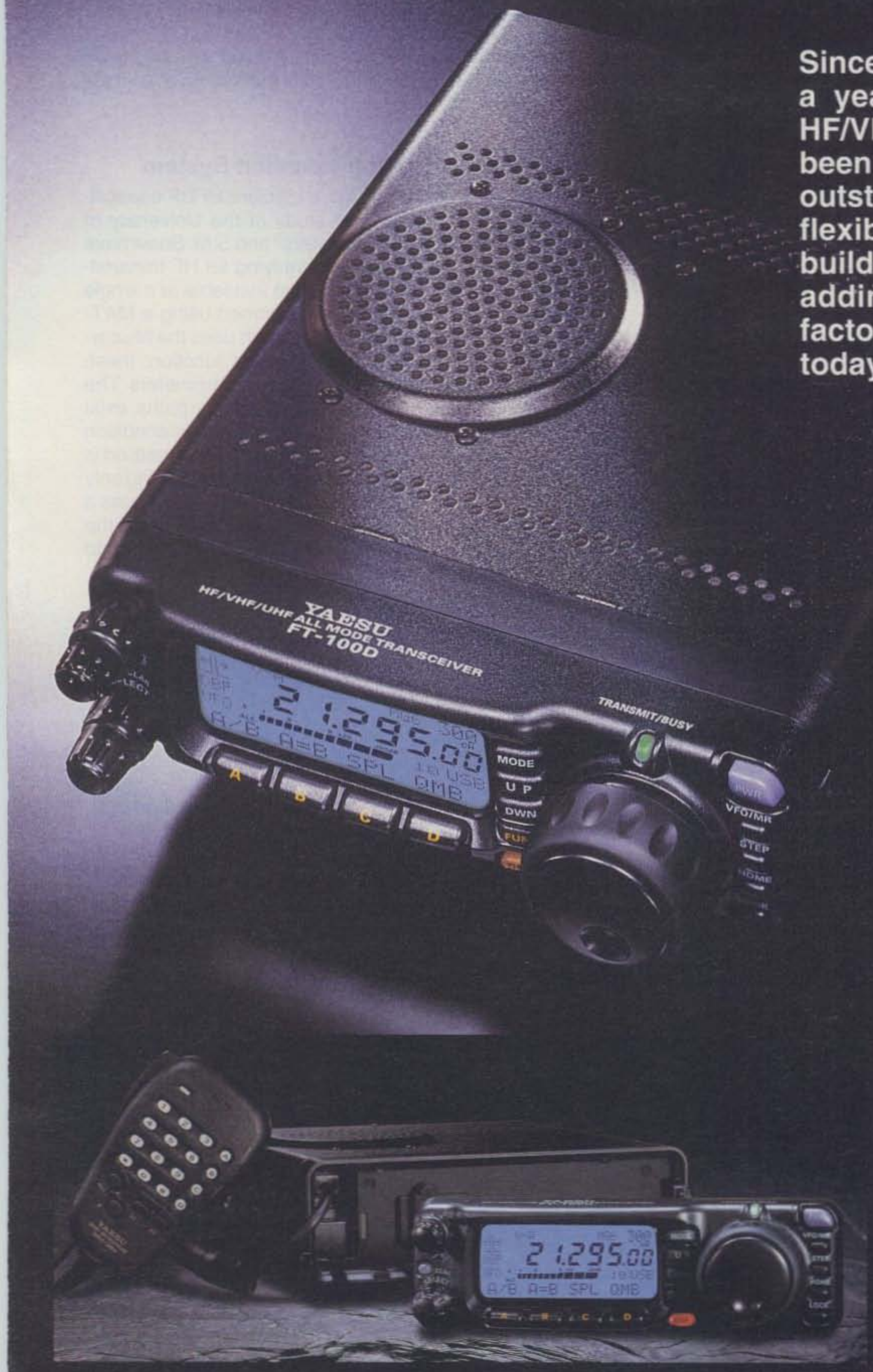
The technology used in such HFDF techniques improved with time, of course, and the ability of various countries around the world to HFDF their adversaries' combatants at sea (and elsewhere) became a formidable "weapon" indeed. However, the ability to use such techniques for domestic purposes (e.g., to locate U.S. amateur operators who violate your Com–munications Act of 1934, as amended) was limited by the cost and number of the systems required, not to mention the space needed for the antennas. What was needed was an HFDF system that used a minimum amount of equipment and smaller antennas.

A Single-Site Transmitter Location System

The need to develop smaller, more efficient HFDF capabilities has long been a subject of study at the University of Leeds. Here Dr. Hal John Strangeways[3] and S.M. Snow have been working on a technique for identifying an HF transmitter's location using only the information available at a single site.[4] Single-site location (SSL) is performed using a MATLAB-based program called TASSEL, which uses the Nelder-Mead algorithm to minimize a multi-variate function; these variables are optimally selected ionospheric parameters. The technique does require that two simultaneous paths exist between the transmitter and the receiver, but this condition is commonplace for ionospheric propagation. The method is highly effective at pinpointing a transmitter location using only a single receive antenna, and as a by-product, it produces a solution for the real-time ionospheric model at the time the measurements are made. The work at Leeds continues to the present (see, for example, Featherstone, *et al.*[5]).



MOBILE DX MASTER



Since its introduction over a year ago, Yaesu's FT-100 HF/VHF/UHF Transceiver has been widely acclaimed for its outstanding performance and flexibility. Now the FT-100D builds on this success story, adding the convenience of factory-installed modules for today's Ham on the go!

FT-100D HIGHLIGHTS

The FT-100D is a high-performance, ultra-compact transceiver operating on the 160-10 meter HF bands, plus the 50, 144, and 430 MHz VHF/UHF bands. Known for its outstanding receiver performance, the FT-100D's easy-to-access DSP system is the cornerstone of the outstanding receiver capability. Providing Noise Reduction, Auto-Notch, and Narrow-Bandwidth Filter selection, the DSP system also includes a Microphone Equalizer for the transmit side.

The new and enlarged speaker of the FT-100D (ϕ66 mm) provides spectacularly clean audio output, to help you dig out those weak signals.

Whether at home or away, the fantastic new FT-100D is The Choice of the World's Top DX'ers. Step up to the FT-100D, and enjoy the thrill of the sunspot peak in style!

MICRO MOBILE

FT-100D

Ultra-Compact HF/VHF/UHF Transceiver

YAESU
Choice of the World's top DX'ers

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Specifications subject to change without notice. Specifications guaranteed only within Amateur bands.Some accessories and/or options are standard in certain areas. Check with your local Yaesu dealer for specific details.

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Today's elite-class operators demand the best RF weaponry available. Yaesu's exciting new MARK-V FT-1000MP answers the call, with an expanded array of receiver filtering, 200 Watts of power output, and Class-A SSB operation capability for the cleanest signal on the band. Enhanced front-panel ergonomics on the front panel save you seconds in a pile-up or a contest "run," and Yaesu's HF design and manufacturing know-how ensures that no short-cuts have been taken in our effort to bring you the best HF transceiver money can buy. For more QSOs in your log, and more awards on your wall, there is only one choice: the MARK-V FT-1000MP from Yaesu!

I. Interlocked Digital Bandwidth Tracking System (IDBT)

The IDBT feature greatly simplifies SSB operation by matching the bandwidth of the DSP (Digital Signal Processing) system to the net bandwidth of the 8.2 MHz and 455 kHz IF stages. The IDBT system accounts for the settings of the IF WIDTH and SHIFT controls, and automatically sets a DSP bandwidth which matches the analog IF bandwidth.

IDBT: A Breakthrough in Selectivity!

II. Variable RF Front-End Filter (VRF)

Protecting the MARK-V's receiver components from strong out-of-band signals, the VRF system acts as a high-Q "Preselector," located between the antenna and the main bandpass filter networks, providing additional RF selectivity on the 160-20 meter Amateur bands for multi-operator contest teams, DX-peditions, or for operation near MW/SW broadcast stations.

VRF Features Large High-Q Coils and High-Quality Relays

VRF Typical Bandpass Response (3.5 MHz)

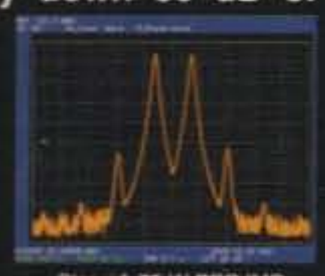
III. 200 Watts of Transmitter Power Output

Utilizing two Philips® BLF147 Power MOSFETs in a 30-Volt, push-pull configuration, the MARK-V's transmitter puts out up to 200 Watts of clean output power, thanks to the conservative design of the PA section.

T-Configuration Heat Sink

IV. Class-A SSB Operation

Exclusively available on the MARK-V FT-1000MP, a press of a front-panel button engages Class-A SSB operation of the transmitter, at a power output level of 75 Watts. Class-A operation produces incredibly clean signal quality, with 3rd-order IMD typically suppressed 50 dB or more, and 5th- and higher-order products typically down 80 dB or more!



Class A 75 W PEP IMD

V. Multi-Function Shuttle Jog Tuning/ Control Ring

The immensely-popular Shuttle Jog tuning ring, which is concentric with the Main Tuning Knob, has a new look in the MARK-V: it now includes the activation switches for the VRF (left side) and IDBT (right side) features, so you don't have to move your hand position to activate these important circuits during contest or pile-up situations!

Access VRF and IDBT Features via Shuttle Jog Dial

Features

■Frequency Coverage: (RX) 100 kHz–30 MHz; (TX)160–10 m Amateur Bands ■Dual In-band Receive w/Separate "S" Meters ■Ten Pole Collins® Mechanical Filter Built-in ■RX DSP Noise Reduction and CW Peaking Filter ■High-speed Automatic Antenna Tuner ■Two TX/RX Antenna Jacks plus RX-only Jack ■TX Microphone Equalizer ■RF Speech Processor ■Direct Digital Synthesis ■CW Spot and Two Key Jacks ■Two Headphone Jacks (1/4" and 3.5 mm) ■Low-Level Transverter RF Drive Jack ■Separate FP-29 Power Supply (30 V/13.8 V DC Output)

Photo shows optional MD-100A8X Deluxe Desk Microphone

HF 200 W All-Mode Transceiver

MARK-V FT-1000MP

EXPAND YOUR DX HORIZONS WITH THE FTV-1000 50 MHz TRANSVERTER!

- 50 MHz Transverter with 200 W PEP Power Output
- Class-A Bias Selection for Low TX IMD (PO: 50 W)
- High-Performance Receiver Front End
- Automatic, Effortless Operation with MARK-V FT-1000MP
- Upgrade to High Power with VL-1000 Linear Amplifier

Specifications

Frequency Range:	50-54 MHz
Antenna Impedance:	50 Ohms
Power Output:	200 Watts PEP
Spurious Emissions:	At least 60 dB down
Power Source:	DC 30 V and 13.8 V (supplied by FP-29 Power Supply of MARK-V)
Dimensions:	9.6" x 5.4" x 13" WHD (243.5 x 136.5 x 331 mm)

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It was as a result of these and other studies, I believe, that your government, and specifically the Federal Communications Commission (FCC), approached me in mid-1999 to assist them in the development and installation of six super-resolution HFDF stations located throughout the U.S. These stations would be used to locate transmitters (and, of course, their operators) that are the source of intentional interference, unidentified transmissions, out-of-band signals, and the like.

The Lauton Institute's Assistance to the FCC

The Lauton Institute has long been a Center of Excellence for studies on signal propagation, with work performed in bands ranging from ULF,[6] through VLF,[7] to the visible.[8] The Lauton Institute also was one of the first research centers to investigate radiowave propagation on other planets.[9] The institute has even been working closely with the Austrian government on the development of super-resolution HFDF systems almost identical to that developed at the University of Leeds. Unfortunately, my work, which has been highly successful (it yielded accurate locations at distances up to 4000 km with transmission times as low as 0.05 s), is highly classified, and even now I am not permitted to discuss it. Suffice it to say, however, that I was not surprised when representatives of the FCC approached me about assisting them with the installation of six super-resolution HASSEL stations in the U.S. Five of these stations—which are located in remote, interference-free areas of Alaska, Maine, Florida, St. Louis, and Seattle—now are in place and operational, and the sixth (in Nevada) is being placed in operation as this is written.

The results, to date, have been nothing less than astounding. While the details are not available because the records were sealed by the U.S. court system, the first week's operation of the Florida HASSEL site netted seven freebanders, ten high-power CB operators, three amateur "police" (two in the 20 meter phone band and one in the 15 meter CW band), and one amateur who was playing music on 3799 kHz, intentionally interfering with a DXpedition station using that frequency. Federal authorities seized the equipment belonging to all of the freebanders as well as to the operators of the high-power CB stations. Three of the amateur operators had their licenses suspended for periods of up to five years; the fourth (a well-known amateur Extra Class operator) had his license revoked permanently. He never will be permitted to hold an amateur license again—ever! Outstanding, to say the least.

Summary

Six HASSEL stations, operated by FCC field personnel around the clock, seven days per week, 365 days a year, should be fully operational in the U.S. by the time this article appears in print. Using only the information available at that single site, each is capable of locating an HF transmitter using no more than a 0.05 s transmission made anywhere in the spectrum from 3 through 30 MHz. The number of cases being prosecuted by the Federal authorities already is nearing 100, with each pursued to the fullest extent of the law. The administrations of the United Kingdom, France, and Germany, among others, already are finalizing their preparations for the installation of HASSEL stations beginning in mid-2001.

Footnotes

1. H. J. Strangeways and S. M. Sow, "TASSEL (Two-Angle Single-Site Emission Locator)," IEE 7th International Conference on HF Radio Systems and Techniques, Conference publication no. 441, pp. 339-343), 1997.

2. Sheppard, D. D., "Radio Direction Finding on High Frequency Short Duration Signals," (abstract), in Modern HF Communications, Advisory Group for Aerospace Research & Development (AGARD), AGARD Lecture Series No. 127, North Atlantic Treaty Organization, 1983. (This work was performed at the Naval Postgraduate School, Monterey, California.)

3. See information available at <http://www.ee.leeds.ac.uk/homes/HJS/> under "Some Current and Recent Research Projects Research Grants/ Contracts/Consultancy, H. J. Strangeways.

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5. Featherstone, W., H. J. Strangeways, and P. Baker, "Validating prediction packages using super-resolution direction finding techniques and oblique ionospheric soundings," in the IEEE colloquium on "Frequency Selection and Management Techniques," IEE Report No. 99/017, pp. 16/1–16/6, 1999.

6. Heisseluft, E., "Broadcasters Threaten Takeover of Amateur ULF Band at WARC 79," *CQ,* April 1977.

7. Heisseluft, E., "Amateur Radio's New Frontier: The Bands Below 30 kHz," *CQ,* April 1985.

8. Heisseluft, E., "All-Night Ionospheric Illumination Through the Use of Large Reflecting Satellites," *CQ,* April 1983.

9. Heisseluft, E., "Ionospheric Propagation Possible on Mars," *CQ,* April 1994.

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U.S. Patent D374,010
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2½ Watt amplifier, volume control, input level control, speaker jack, PTT sense line, line level output. 9½x2½x6 inches.

Plugs between your transceiver or receiver and external speaker or headphones. use 12 VDC or 110 VAC with MFJ-1315, $14.95. Cable Pack, MFJ-5184, $7.95, includes receiver cable, DC cable, 2 open-end TNC cables.

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MFJ's exclusive *tunable Spotting Tone*™ -- accurately tunes even the narrowest CW filter.

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Has automatic notch with variable aggressiveness, new quieter 2½ Watt audio amplifier, new speaker switch keeps phones always active.

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For MFJ-784, order **MFJ-55, $29.95**. Gives you most features of the MFJ-784B.

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CQ Reviews:

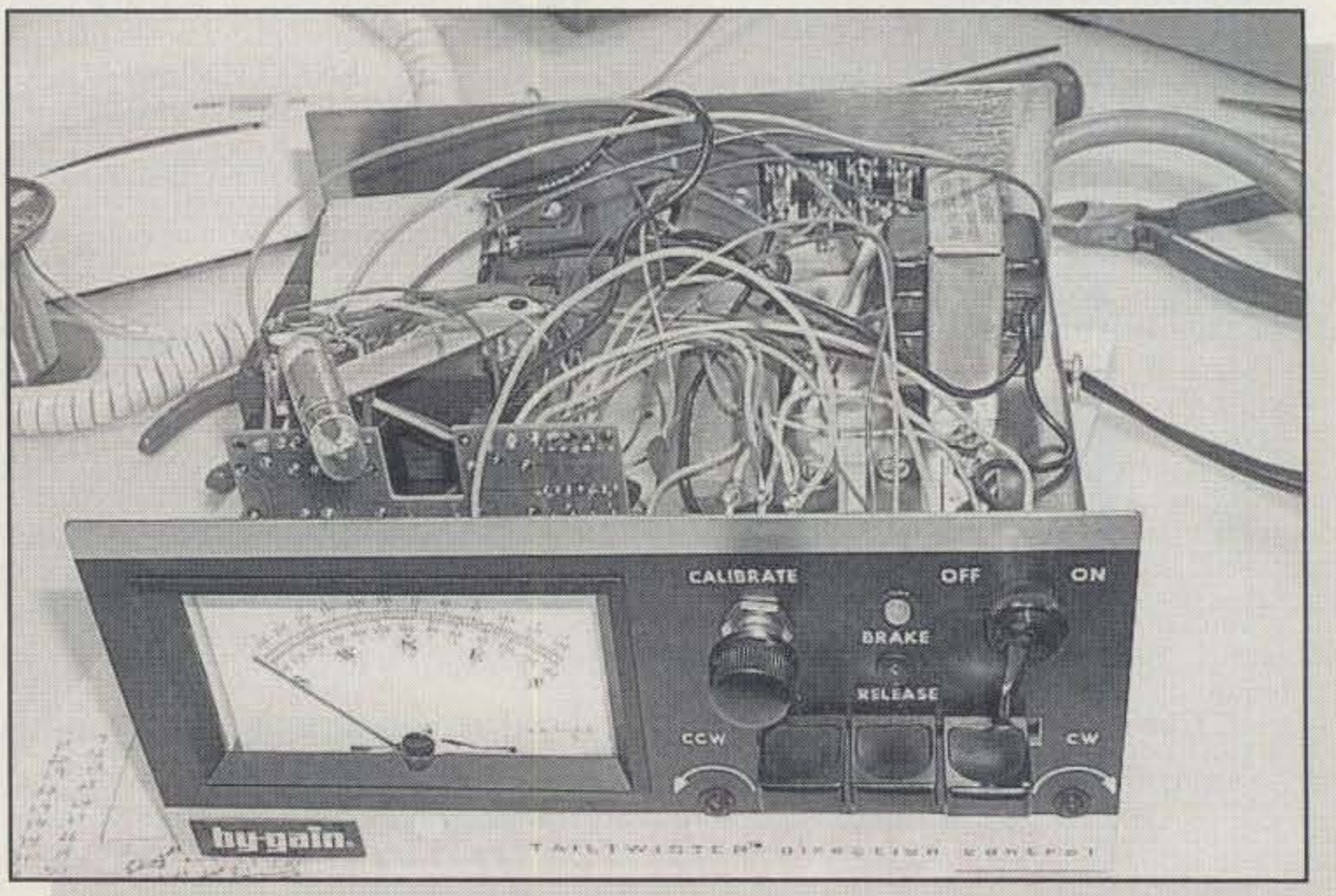
Rotor-EZ from Idiom Press

BY RICHARD A. ROSS,* K2MGA

Over the years, I've written a fair number of product reviews for *CQ*. Many of them come to the keyboard (or typewriter) as painfully tortured experiences, largely because of my desire to stay focused on the readers' interests while not ignoring the interests of the manufacturer to see his product presented in the most supportive way possible. This review of Rotor-EZ from Idiom Press is different: This review practically wrote itself.

Rotor-EZ is an accessory kit which can be added to the control boxes of almost all the many variations of the venerable Ham-M and Tailtwister from Hy-Gain Electronics. What Rotor-EZ adds to these rugged work horses is a good dose of modern digital technology which makes DXing and contesting with a beam antenna so much more fun. Rotor-EZ takes the drudgery out of holding down a few buttons for up to a minute while the rotor does its thing, time which denies the operator the ability to concentrate on other aspects of operating. I shudder to calculate the hours lost during a contest weekend waiting for the indicator needle to slowly creep towards the desired direction indication. Thankfully, that's a thing of the past.

Before getting into the assembly and installation of the Rotor-EZ board, let's take a quick look at life with Tailtwister or Ham-M in year 2001. My Tailtwister is a fairly recent version, but operation is identical in all versions.



From the front panel, the only clue that Rotor-EZ has been installed is the additional bi-color LED above the Brake Release LED. Inside, it's quite a different story. Suggestion to the manufacturer: To avoid misuse, supply an adhesive-backed label to indicate the presence of Rotor-EZ.

Features

Using the Autopoint function, simply turn the old "Calibrate" control until the indicator needle points to the desired direction. Tap the Brake Release button, and go about your business. If you'd prefer to watch the proceedings, what you'll see is the Status LED, a new bi-color LED above the Brake Release LED, gradually turn from orange to green as the meter needle slowly moves to the position you preset, and then stop a few degrees short of the set point to allow the antenna to coast to a stop before the brake resets itself. It's not only very easy, but I must admit to a certain degree of entertainment value in watching, HI!

In my opinion, that's the single most valuable aspect of Rotor-EZ, but it's got so much more than that going for it. An easy-to-install optional add-on brings RS-232 control to your old rotor, allowing you to pick up aiming data from your computer's logging program and aim the beam with a keystroke or two.

Manual operation is available exactly as before Rotor-EZ installation with the sole exception that a five second delay before brake reset guards against a brake jam that is common with these rotors. Over the years other add-on accessory products have offered this protection, too.

In addition, the Rotor-EZ firmware includes an unstick routine. Before the rotor begins turning in the desired direction using Autopoint, the rotor is pulsed for one second in the opposite direction, pauses for one second, and then proceeds to run normally until the desired

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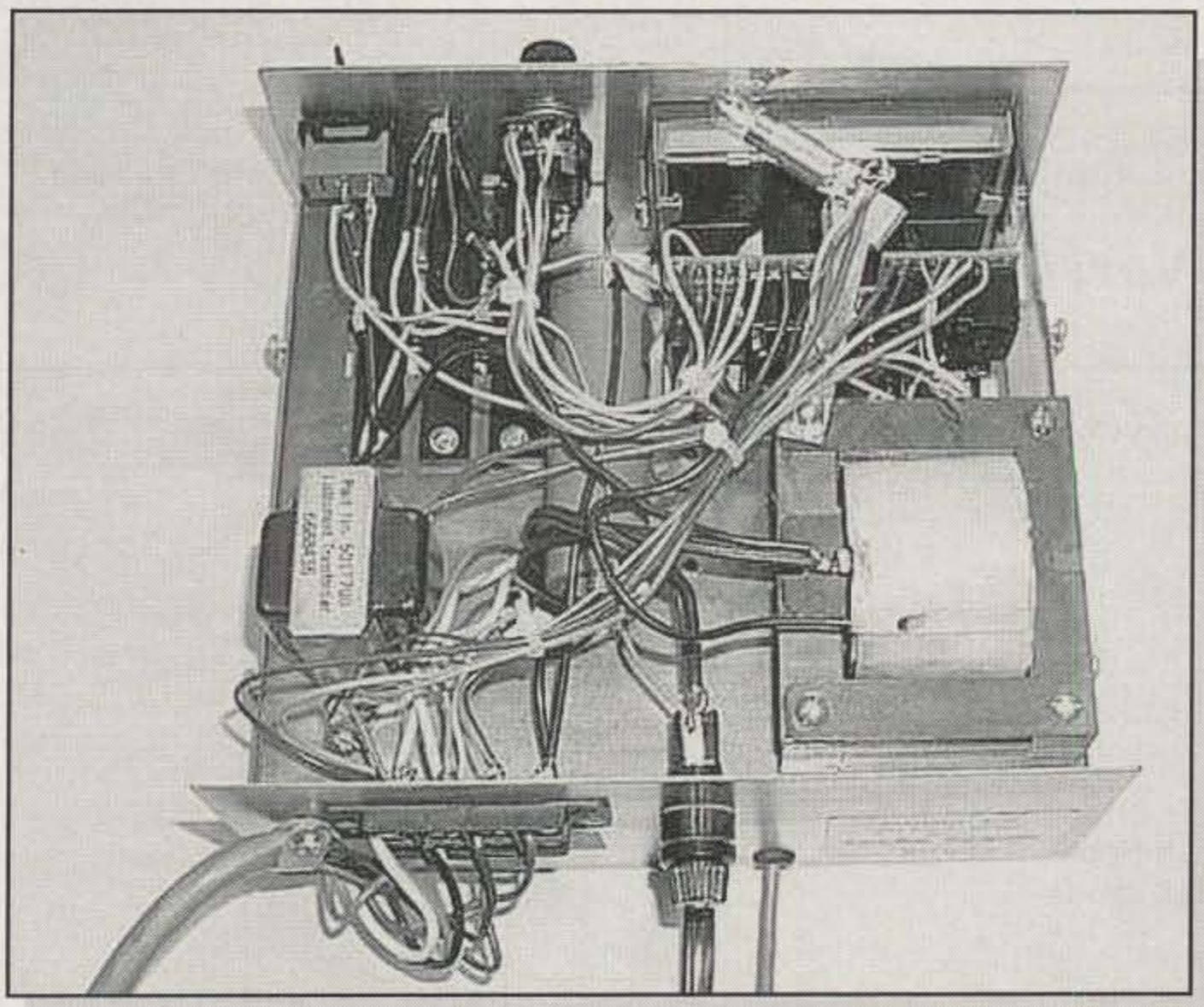

If you've ever ventured inside the control box of your Tailtwister or Ham-M rotor, you'll quickly notice the addition of the densely packed Rotor-EZ circuit board mounted to the meter terminals. Recent control boxes also use a PC board mounted to the terminals which is removed to make way for Rotor-EZ. Just to the right of the fuse holder and power cord on the rear panel is the new shielded cable terminated in a computer D-connector which provides the RS-232 connection to your computer. Most of the original internal wiring is rerouted or replaced by Rotor-EZ wiring.

bearing is reached. As experienced Tailtwister users will recognize, Rotor-EZ is executing automatically a simple routine we've all used for years to overcome that occasional brake jam that always seems to occur at the worst possible moment.

An overshoot option shuts down the power to the rotor three seconds before the rotor reaches the desired heading, allowing the rotor to "coast" to a gentle stop at the desired point.

An electronic end-point lockout excludes the last five degrees of rotation before the end stop in Autopoint mode in order to provide added protection against end-stop jams. If you wish to point the antenna to a bearing within those last five degrees, you can do so manually, but of course you then run the risk of an end-stop jam.

Firmware includes a jam detection circuit. In the event that the rotor should be unable to execute a command due to a jam despite the jam protection circuitry, the orange Status LED begins blinking continuously to indicate a problem that Rotor-EZ cannot solve. A single tap on the Brake paddle turns off the blinking LED. When the brake has reset, the rotor then is ready to accept a new command.

For those who have a second antenna installed 90 degrees offset from the main antenna to minimize interaction between closely-spaced Yagis, Rotor-EZ provides an easy-to-use option which offsets the meter indication by 90 degrees so you can finally tell where the darned thing is pointing! The Status LED blinks alternately red and green as a reminder that the 90-degree offset mode has been selected.

Assembly

The small Rotor-EZ PC board mounts to the terminals of the rotor control box meter and connects to existing terminals and controls using supplied wire. Assembly of the board was a bit tedious for my less-than-perfect eyes. A good stand magnifier and strong work light are certainly in order for anyone past the age of about 35 or 40. With my aged eyes, assembly took about 2 1/2 hours, with another 1 1/2 hours to install and test the assembled unit. (A reviewer in *QST* claimed 1/2 hour board assembly. Amazing!) If there's a complaint about the board, it would be that the solder pads are too small for comfortable hand assembly. It looks as if the board would work beautifully with a commercial wave soldering setup. Be sure you use a good temperature-controlled soldering pencil with a very small tip. If you don't own one, you should.

The assembly instructions supplied by Idiom Press are adequate to complete the job, although a bit of editing would help. If you grew up on Heathkit assembly instructions, you'll be disappointed, but the Idiom Press instructions will get you where you have to be.

Conclusions

If you're a Tailtwister or Ham-M owner you won't find a better way to invest 100 bucks to improve your ease of operation in the shack than Rotor-EZ . Throw in another $30 and you'll add the RS-232 option. Now add one day of smelling the delightful aroma of hot rosin core solder as you get your hands back into the belly of the beast, and you'll wonder how you ever survived without Rotor-EZ. It's also so nice to remind yourself that you really do have the skills to build something electronic.

Rotor-EZ is manufactured by Idiom Press, Box 1025, Geyserville, CA 95441 (website: <www.idiompress. com>).

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Math's Notes

What's New And How To Use It

BY IRWIN MATH, WA2NDM

A Novel Experiment

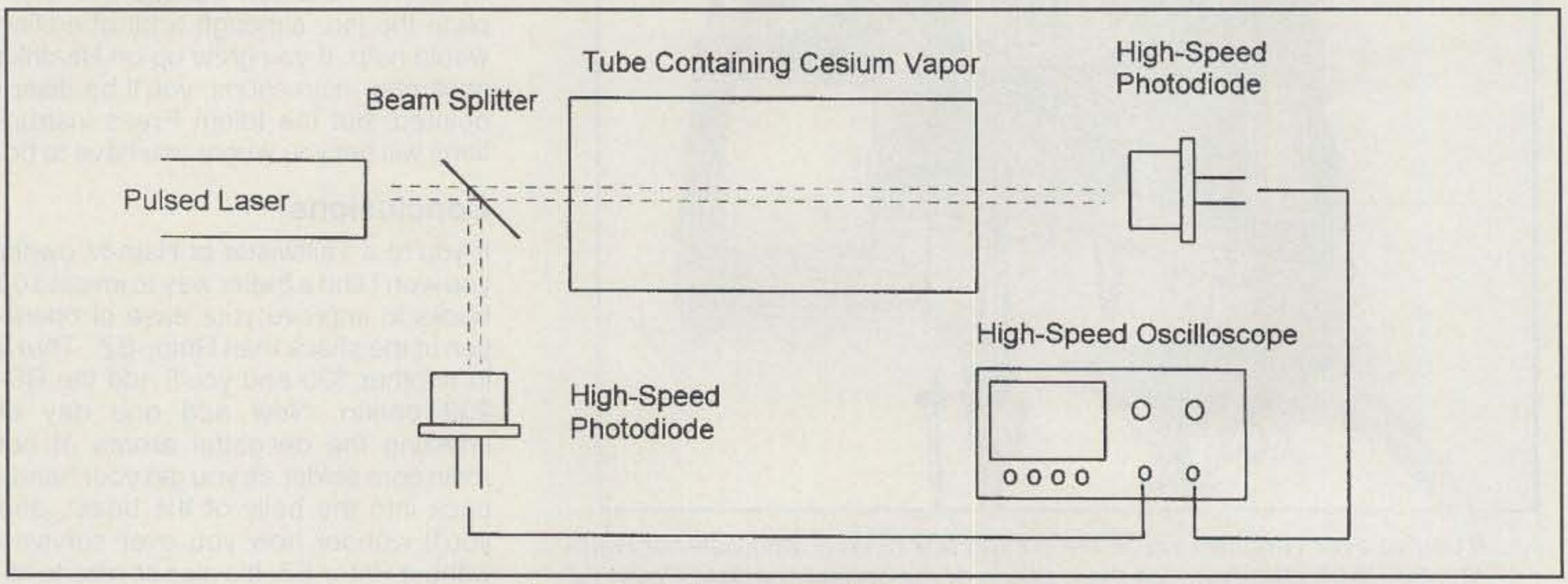

Fig. 1– Basic "faster than light" experiment.

This month is the ideal time to indicate the results of some experiments we have been made aware of regarding the phenomena of the speed of light as it relates to communications. You will recall that at the end of last year some scientists noticed that when a pulse of light from a laser was sent through a tube containing cesium gas, the pulse appeared to exit the tube more quickly than it should. This experiment seemed to indicate the pulse traveled faster than the speed of light as it passed through the gas. Although Albert Einstein indicated that the speed of light is an absolute constant in the universe and cannot be exceeded, this experiment seemed to indicate that *he may have made an error.*

Fig. 1 is a diagram of the original experiment, and fig. 2 shows the results. Since light travels at approximately 1 nanosecond per foot, the output pulse occurs before it should. Where it should occur (according to conventional physics) is indicated by the bottom line in the diagram. The group of scientists I am talking about not only repeated this experiment, but went on to experiment with other types of gasses as well. The results were quite unexpected, as can be seen from fig. 3. It seems that almost all metallic gasses exhibit some "acceleration factor," with mercury vapor being one of the most prominent. The only

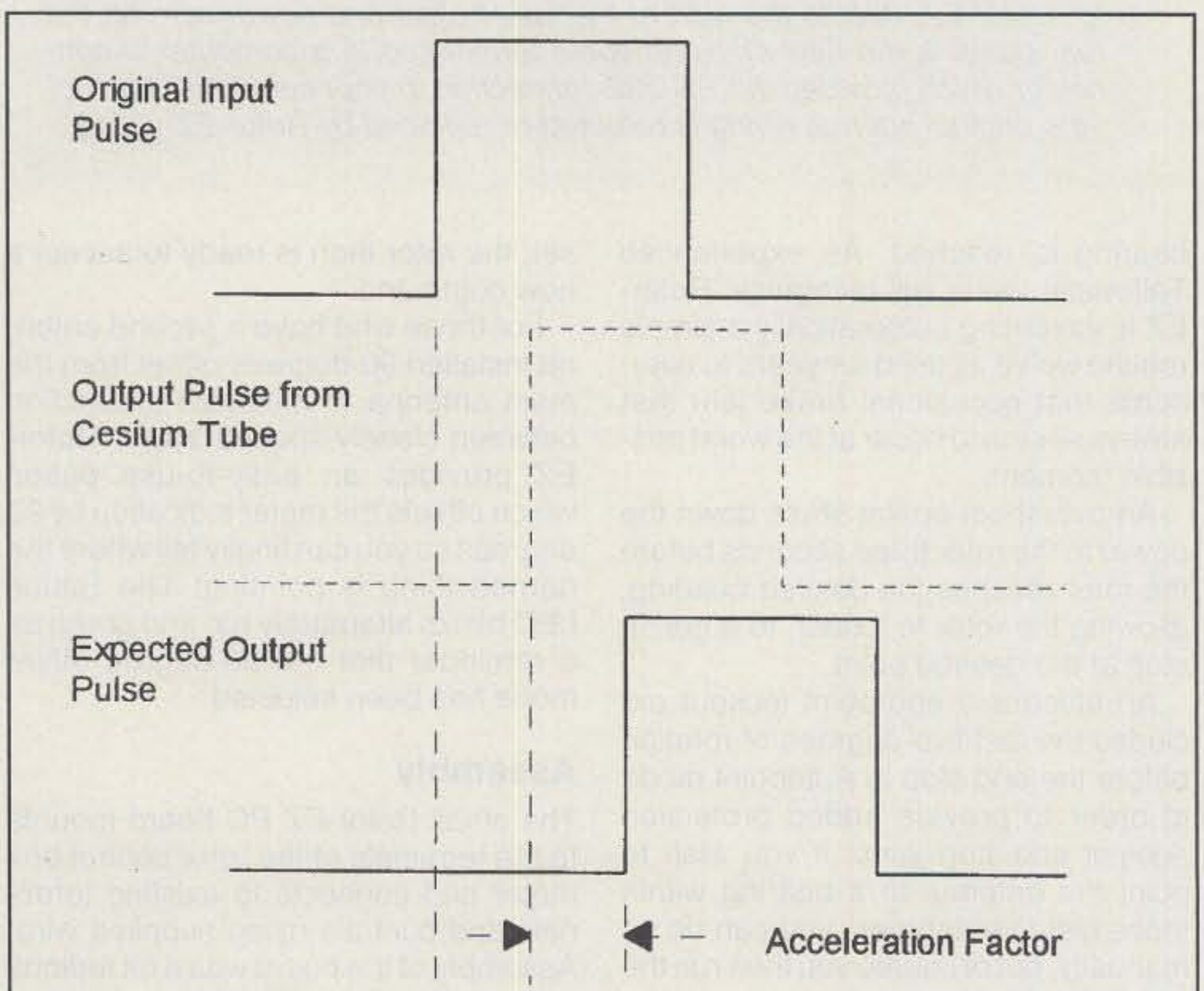

Fig. 2– Results of the experiment of fig. 1.

reason this was never noticed in Einstein's time was that lasers and high-speed scopes were not available.

Those of you who wish to experiment with this phenomenon can readily obtain an inexpensive source of a metallic gas in a common fluorescent lamp. The only problem is that most lamps of this type have an inner coating of a phosphor. It is this phosphor that glows

c/o CQ magazine

ACCELERATION OF A LASER PULSE THROUGH VARIOUS GASSES	
GAS	ACCELERATION FACTOR
Aluminum	1.000005
Copper	1.0000047
Mercury	1.000055
Silver	1.00000082

Fig. 3–Acceleration factors of some metallic gasses or vapors. Note that all gasses were obtained by heating metal samples beyond their melting point.

to produce the white light. So-called "UV" or "black light" tubes do not contain the phosphor, and this is what one should use for the experiment.

Fig. 4 shows the suggested setup. You will note that a very high-speed scope is necessary, as the difference between the input and output pulse is quite small and difficult to measure. If you have, or can obtain, suitable equipment and choose to duplicate these experiments, be sure to observe the precautions of not viewing the laser pulse directly or breaking the fluorescent tube, as either action can be quite harmful physically.

If you now consider that we are witnessing the output light pulse before we actually should (in time), you could make a case that we have brought a pulse from the future into the present! Think about it. In fact, since we already have received the pulse (before its correct time), it will no longer be there when the correct time actually occurs. We truly have brought it into the present. What implications!!!

You are probably wondering where all of this leads. Well, light is electromagnetic radiation. Certainly no one would argue that point. Therefore, if a laser pulse can be made to move faster than light, why not a conventional RF pulse? Both are electromagnetic. The only difference is frequency!

Let us now consider the experiment of fig. 5. Here we have an electron gun, exactly the same type as used in a common cathode ray tube. Its job—which it does quite well, by the way—is to produce a collimated beam of electrons which can easily be modulated by an external signal. Every oscilloscope can do this (remember the Z axis?). Our "CRT" is not used for signal display, however, but is filled with mercury vapor, and the end that normally would be used for viewing is left uncoated. The output beam is therefore free to pass through the glass.

At the end of the "CRT" is a high-speed photodiode. The beam from the "CRT" is focused onto this photodiode, and the output from the detector fed to a high-

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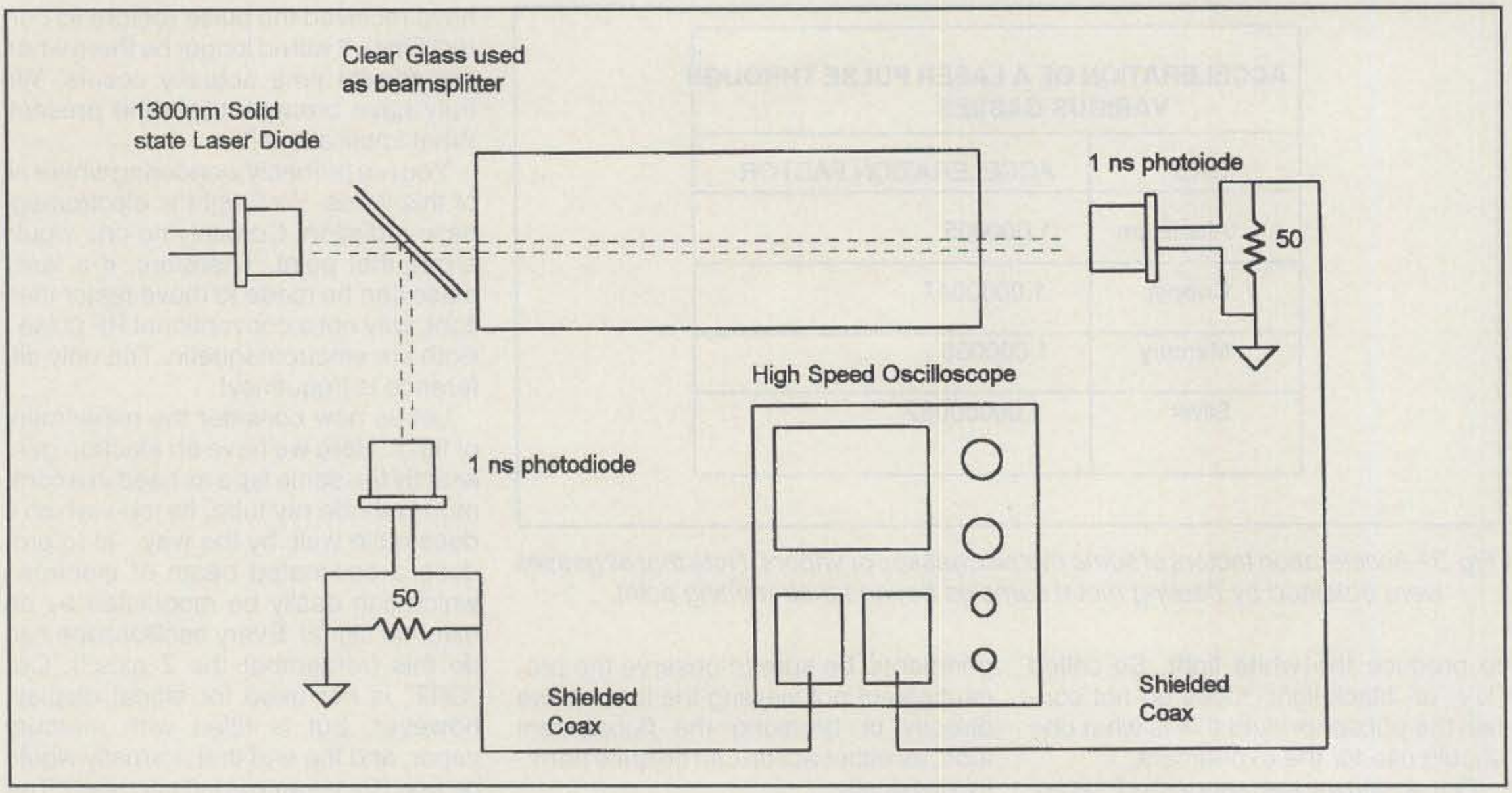

Fig. 4– Experimenters' "faster than light" setup.

speed op-amp mixer. At the same time the electron beam is modulated by a high-frequency oscillator, and a portion of this modulating signal is also applied to the mixer. As in any mixer (remember the superhet receiver), the difference between the two signals is an output signal that is made up of the sum and difference of the input signals. In our case, however, one input signal seems to have come from the future!

If we now connect a third input to the op-amp mixer from an antenna and then tune the modulation source so that the overall combined difference signal is in the conventional RF range (including the future signal), I wonder what we would receive.

Your comments are invited!

73, Irwin, WA2NDM

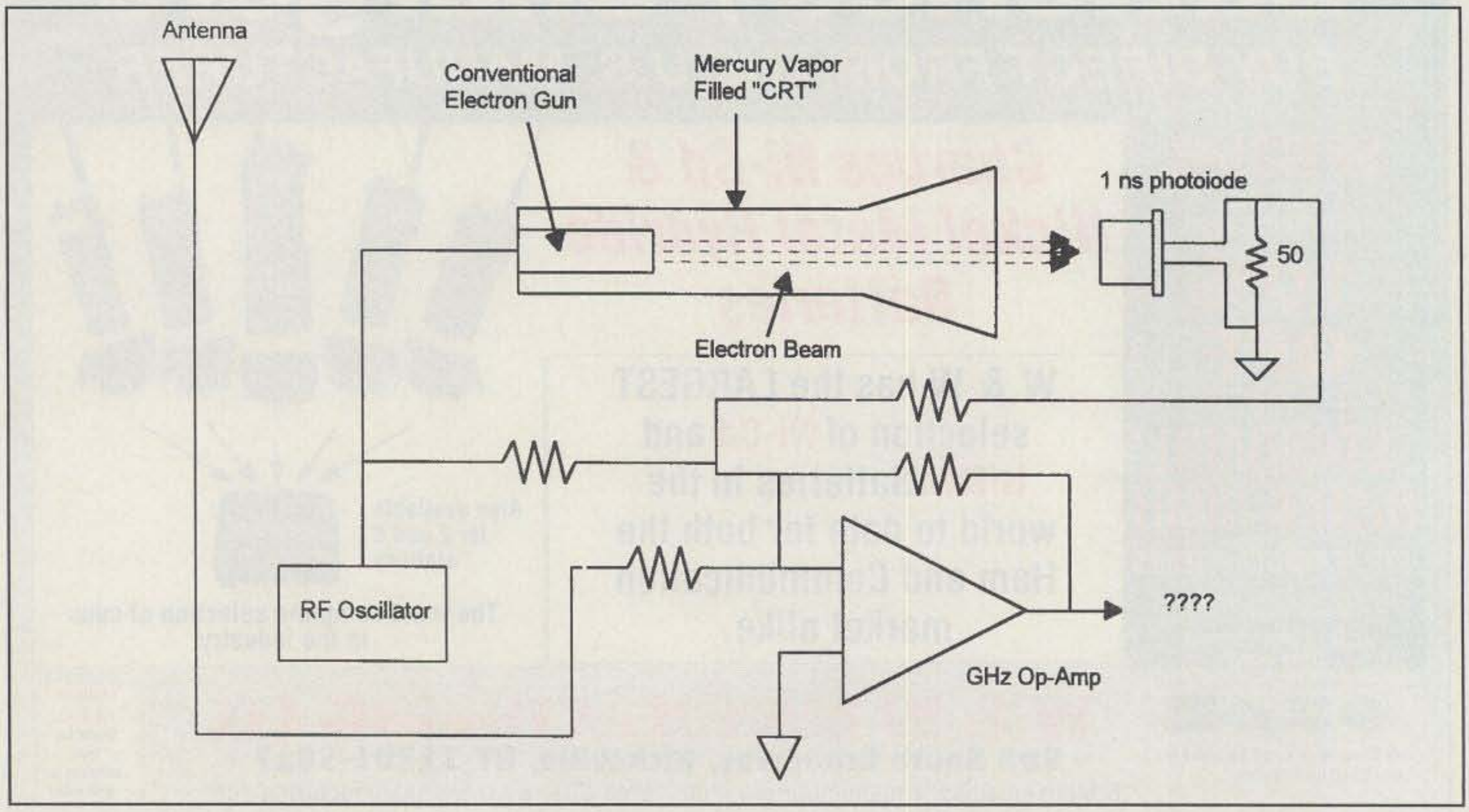

Fig. 5– Possible future receiver.

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Bill DeBennedetto, K1PVT, SK

A brief remembrance by K2MGA, with much input from a few of his many friends.

It is not *CQ*'s normal practice to run obituaries for Radio Amateurs who are not numbered among the extended staff of the magazine. This is a particularly sad exception.

Bill DeBennedetto, K1PVT, of Madison, Connecticut died on January 26, 2001 after a brief illness. He was 52. What makes his passing especially noteworthy to me is that Bill was my "kid cousin," and I had gotten him started in Amateur Radio so many years ago. I know all too well that death is not fair. Were it so, we'd still be in the presence of hundreds and thousands of wonderful human beings—hams and non-hams—who met their ends long before they had achieved the pinnacles of their lives ...long before we had fully appreciated them as human beings.

Bill was one of those very special people who lit up a room just by walking in, who always had a joke, a story, a tall tale for anyone and everyone he touched. His friends numbered in the hundreds, his fond acquaintances in the thousands. I'm sure that somewhere there was an enemy or two also, because it's difficult to lead life with gusto without treading on someone's toes.

Let me turn the next several paragraphs over to the thoughts of a few of Bill's ham friends:

Tony Vanacore, AK1O, remembers him as an active 6 meter contester in the sixties before the days of cable. His powerful station in Connecticut regularly received TVI complaints not only from Connecticut, but from Long Island in New York as well. He often joked that Bill was one of the few QCWA members who still had a full head of hair.

Bruce Torello, K2RPM, writes, "Bill had a great sense of humor, a great wit about him. He was a dear friend who will be sorely missed."

Long-time friend and business partner Carl Passafuime, N1ORW, says, "Bill was a ham's ham, a unique character and most certainly impacted everyone who knew him. The untimely loss of Bill has left a void in our lives."

An ARRL life member, Bill was best known for his numerous good-natured jovial assaults on Amateur Radio operators worldwide. As a regular contributor to the mayhem at annual events such as Deer Chester, SCARA hamfest, and many Field Days, Bill brought smiles to many attendees throughout the years. He was also a willing and eager Elmer for countless new hams. If you needed help with a ham project, Bill would mysteriously appear, most often doing the job himself. That's the way he was.

One recent tale illustrates his free-spirit as well as his total dedication to Amateur Radio. Last summer, he had just picked up a young lady at her home for a first date. Once in his car, she observed his 2 meter radio under the dash of the car. She inquired about what it was, and he patiently explained. Moments later, the local repeater broke the squelch with a call from a local ham. Annoyed, the young lady asked, "Are we going to have to listen to that all evening?" Bill replied, "Nope." He quickly made a U-turn, taking the young lady home, and informed her that the date was over. Maybe that's why he was still a bachelor!

Licensed in 1962 at age 13 as KN1PVT in Connecticut, Bill graduated with a degree in Communications Technology from the Connecticut School of Electronics and attended the University of New Haven.

Bill was an active DXer and had accumulated 300-plus countries towards DXCC Honor Roll. He was also actively involved in VHF contesting and achieved many single and multi-operator contest awards. At the time of his death, he was close to achieving his 5-Band Worked All Zones award. He was a member of the Southern Connecticut Amateur Radio Association (SCARA), The Stratford Amateur Radio Club (W1ORS), and the Quarter Century Wireless Association.

For many years Bill worked as a communications engineer and was owner of The Communications Group, a company specializing in the design and installation of a wide range of commercial and residential communications systems.

Bill was a confirmed bachelor and is survived by his sister, Aurora Beatty, brother-in-law, Donald Beatty, two nieces and a nephew, and a dozen other cousins, including K2MGA.

Our thanks to K2RPM, AK1O, N1ORW, and the dozens of Bill's friends who were so amazingly supportive of him as we all stood by, near and far, and watched helplessly as he slipped away. We'll all miss you, Billy.

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Reader Survey
April 2001

We'd like to know more about you—about who you are, where you live, what kind(s) of work you do, and of course, what kinds of amateur radio activities you enjoy. Why? To help us serve you better.

Each time we run one of these surveys, we'll ask a few different questions and ask you to indicate your answers by circling numbers on the adjacent survey card and mailing it back to us. If the card is missing, just write your response numbers and the date of this issue on a postcard and mail it to CQ Reader Survey, 25 Newbridge Road, Hicksville, NY 11801. We'll pick one respondent to each survey for a complimentary one-year *CQ* subscription (or renewal).

This month we have some questions about QRP (low-power) operating on HF.

Please indicate... **Circle Survey Card #**

1. Do you operate on the HF ham bands (3–30 MHz)?
Yes.....1
No.....2

2. If you answered yes to #1, have you ever operated QRP (5 watts or less) on the HF ham bands?
Yes.....3
No.....4

3. What is your opinion of QRP operating?
My favorite way to operate.....5
Fun to do once in a while.....6
I'll do it if it's the only way I can get on the air.....7
Not for me; life's too short for QRP.....8

4. If you operate QRP, is your main motivation...
... the operating challenge?.....9
... the technical challenge?.....10
... the camaraderie?.....11
... limitations on high-power transmitting?.....12
... other.....13

4. If you operate QRP, what is your favorite QRP mode?
CW.....14
SSB.....15
Digital.....16

5. Is your QRP equipment...
... homebrew?.....17
... a QRP-only kit?.....18
... a QRP-only commercial rig.....19
... a standard commercial rig with the power turned down?.....20

6. Do you do most of your QRP operating...
... at home?.....21
... while mobile?.....22
... while portable?.....23

7. Is the antenna you use primarily for QRP...
... a Yagi on a tower?.....24
... a permanent wire antenna?.....25
... a temporary wire antenna?.....26
... a mobile antenna?.....27

8. Are you a member of a QRP specialty club?
Yes.....28
No.....29

Thank you for your responses. We'll have more questions for you in our next reader survey.

What You've Told Us...

In our February survey we asked about your view of today's hams as builders and about your own first-hand experience. Nearly three-quarters of you who responded agreed with the common perception that today's hams are "appliance operators" who don't build equipment. On the other hand, very few of you said that description applies to you, with 85% having built at least one piece of ham gear from a kit, 67% having built something from magazine plans, and nearly half (49%) from your own design. Only 8% said they'd never built anything.

For most of you, building equipment is limited to your hobby. Only 24% had built something for work from a kit or equivalent; 38% had built equipment for work from plans; and 32% from their own designs. Hams helping hams appears to be alive and well among our readers, with 62% saying they've helped or taught someone to build ham gear, and 58% saying someone else had helped/taught them.

Nearly four in ten had built something as part of a club project, and only 17% said they would *not* be interested in taking part in a club construction project (activities chairmen, here's your cue!). An impressive one-third had participated in a large-scale construction project, such as a club station or repeater, while 36% said they'd like to do that, 41% said they might like to do that, and 23% said that's not for them.

Finally, we asked how you rate yourself as builders, and an incredible 79% of you checked off either experienced (37%), advanced (26%), or expert (16%). Only 21% considered yourselves novice builders, and 10% describe yourselves as non-builders. (Obviously, some folks checked more than one, since it adds up to 110%!)

All in all, it seems the perception that most of you share about today's hams being "appliance operators" doesn't hold much water when applied to *CQ* readers. Maybe we all need to redefine our perceptions.

This month's winner of a free one-year subscription to *CQ* is Bill Henderson, N3XXA, of Lansdowne, Pennsylvania. As always, thank you to all who responded to our survey.

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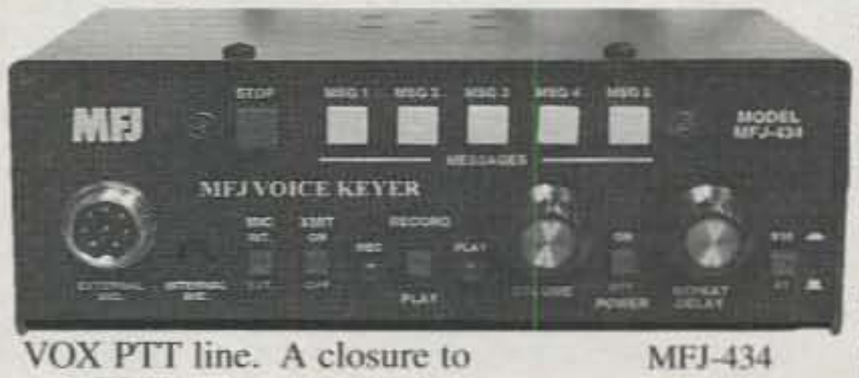

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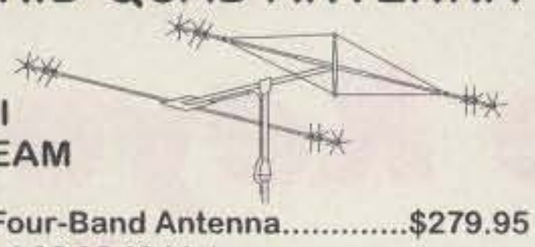

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Our Readers Say

AMSAT President Responds To February Editorial

Editor, *CQ:*

Relative to your editorial in February *CQ* and Phil Chien's column in the same issue, I think a few things need to be said.

First I understand completely the lead times incumbent in magazine publication. Such lead times make it inevitable that fast-moving events are often not reflected in what appears in print. Unfortunately, this is the case with both your editorial and Phil's column. A considerable amount of progress has been made with respect to AO-40 since both were written. It might be as well to remind your readers to depend on the AMSAT News Service (ANS) or bulletins released by ARRL for the up-to-date information on events such as the continuing attempts to bring AO-40 into useful service.

With respect to your comment that space is not a sure thing, I agree wholeheartedly. There are numerous examples of instances when things do not go as planned that can be cited, most of them not involving volunteer labor and the kinds of cost-control measures AMSAT organizations bring to bear. You did a good job pointing out a few of these instances.

In response to your question as to whether the unfortunate difficulty with AO-40 signals the end of AMSAT, I can assure you that it does not. We are already planning what should follow. Indeed, such planning would be taking place even if AO-40 was behaving just as it should have. We solicit opinions and ideas from *CQ* readers in this planning effort. As to your comment that there should be more than one group designing and building amateur satellites, we agree. But it must be pointed out that such has been the case for many years. Soviet (Russian) amateurs have built and launched a number of hamsats. In addition, so have the British, Japanese, South Africans, French, South Korean, and Italian groups, as well as a number of others. In the USA many universities have built amateur satellites, including Weber State in Utah, Stanford, Arizona State, and the Air Force Academy. Other similar efforts are currently in the works.

It might be well to point out that the organization known as AMSAT is actually the Radio Amateur Satellite Corporation. It has become known, unofficially, as AMSAT-NA, the NA standing for North America to distinguish it from the many other Amateur Satellite organizations that have been formed around the world such as AMSAT-UK in Britain, AMSAT-DL in Germany, JAMSAT in Japan, and many others.

AMSAT-NA's part in the design and construction of AO-40, known as Phase 3D prior to its launch on November 16, 2000, though substantial, was not all encompassing. AMSAT-NA was responsible for providing the space frame and some other critical components. It also provided the site where most of the assembly work, and much of the checkout, took place, and arranged for thermal vacuum and vibration testing of the completed spacecraft. However, the direction of the project was, and is, under AMSAT-DL, specifically Dr. Karl Meinzer, DJ4ZC, who is the Phase 3D/AO-40 Leader. Karl is also President of AMSAT-DL. On the fiscal side, AMSAT-NA raised approximately half of the money needed for the construction, test, and launch of the satellite, with the rest coming from overseas AMSAT organizations, principally AMSAT-DL, AMSAT-UK, and JAMSAT. JAMSAT also designed and built the camera which is on board. It should also be noted that AO-40 is licensed in Germany and carries the callsign DPØWH. The "WH" is in honor of the late Werner Hass, DJ5KQ, who built and tested a number of the RF systems. In fact, all of the RF systems on the satellite came from European groups, including the GHz transmitters which were built by Finnish amateurs.

With this explanation as to how the management of the Phase3D/AO-40 Project has been, and still is being carried out, I want to emphasize that all information regarding ongoing efforts to make the satellite available to amateurs worldwide must either originate with DJ4ZC, or be cleared by him or one of his designees. All such information, appearing in ANS bulletins released by AMSAT-NA, has received that "stamp of approval."

Finally, I wish to thank you, *CQ,* and your readers for your support of the amateur satellite program in general and AMSAT in particular. We look forward to future mutual cooperation and will endeavor to keep you informed as to developments to the extent that we are able.

73, Robin Haighton, VE3FRH
President AMSAT-NA

Robin: You are certainly correct that fast-moving events and magazine lead times do not mix well. We also agree that readers are well advised to monitor more immediate sources of breaking news, including those you mentioned, plus the CQ *website and e-mail news update service. Thank you for the explanation of how AO-40 is managed, and the process of getting news reports out to the ham community. That news flow has improved markedly in recent weeks and we appreciate any effort you may have made to bring about a steadier flow of "official" information. As I'm sure you noticed in last month's survey results,* CQ *readers are very supportive of the amateur satellite program even if they are not active satellite operators.*

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What does last year's presidential election have to do with the QSL card you might not have received this week from that DX station you worked a year ago? Perhaps quite a bit, says AF1US.

QSLing in Cyberspace

BY GARY PALAMARA,* AF1US

Following a heated presidential campaign, the 1960 election night totals were close, with a comparatively few votes separating the candidates. Widespread rumors of voter fraud and abuse in several areas of the country were reported. Mercifully, the apparent loser conceded defeat and the country moved onward. After the election there was talk of reforms to improve vote tabulation, and new systems were devised to make voting faster and more accurate. In 1964 the Georgia counties of Fulton and De Kalb became the first jurisdictions in the United States to adopt the use of the newest technology on the market, voting by punch-card ballot and computer tally machines. Now, 40 years later and in light of recent events, a technology that was state of the art in the 1960s looks flawed and outdated.

If an amateur radio operator from 1960 could magically travel through time and space to visit our new millennium (*a la* the movie *Frequency*), what would he or she recognize about the hobby today? CW, although alive and well, has lost some ground to other forms of digital communications. AM phone, which is still cherished by many, has given way to the more power- and spectrum-efficient mode of single sideband. In 1960 practical communications via satellite was only being talked about (Telestar 1, the first orbiting communications satellite, was launched in 1962 by A.T.&T.). Who could have imagined that computers would become a real part of almost every ham shack? Paper station logbooks have all but disappeared. Shiny silver disks holding millions of names and details have replaced the "telephone book" size directories of the past, and searching for related information about our hobby on something called the "internet" would probably push our time traveler over the edge.

Electronic QSL card to AF1US from Saint Pierre and Miquelon via eQSL.cc.

The QSL Tradition

One staple of the amateur radio hobby that has remained virtually unchanged since it began is the sending and receiving of QSL cards. I was not a ham in 1960, but over the years I have spoken to countless folks who were. While QSLing today is viewed as a courtesy, in the "old" days it was more a matter of fact. Everyone sent QSLs back then, and almost all the time. It's unclear when the first QSL cards were made and when the custom of sending cards back and forth became established. Humans, being both competitive and exacting, probably wanted to keep track of their geomagnetic conquests in the form of logs and country totals. In 1935 the article "How to Count Countries Worked, a New DX Scoring System," by the late Clinton B. DeSoto, W1CBD, appeared on the pages of *QST*. The article spoke of "entities," not countries, when describing geographical or political boundaries. Those general guidelines still hold true today for counting totals.

With the counting of entities came "bragging rights" and the inevitability of award programs. I have run into any number of amateurs who do not participate in the awards process by saying, "I know I worked a country, state, or zone; I don't need a QSL card or an award to prove it." If you're one of those folks, this article will be of little value. For the rest of us, however, QSLing and the awards process add value to the amateur experience.

Until now, your options for QSLing another station were limited to two choices. After the contact is made and recorded in the logbook (paper or computer), a paper QSL card is sent to confirm the exchange. Some stations send the majority of their cards "direct," which means they send the card to the

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address of the station they worked or to the station's QSL manager. In most cases, either domestically or internationally, return postage is included for a QSL return request. This makes sense. After all, the stations you worked may not need your card as much as you need theirs, so why burden them with the postage? The expense becomes particularly onerous with "rare" DX stations whose cards are in great demand. Partly in an effort to reduce the costs involved with this "direct" card system, somewhere along the line a second option arose to aid the exchange of cards. A worldwide network of QSL bureaus was created.

Although there are some domestic QSL bureaus, generally bureaus exist only for contacts between countries. Stations who participate in the bureau system send cards in bulk and depend on volunteers at both ends to sort and direct the cards. According to the ARRL, its outgoing QSL bureau alone handles more than 2 million cards per year. The bureau system, while slow, can save money. It would not be unusual for a bureau card to take as much as a year or two to make its round-trip journey. With the two forms of QSLing (direct and bureau) still in widespread use today, there is now a third, long-awaited contender entering into this mix, *QSLing via the internet,* or what I will call **"QSLI."**

While using the word "internet" for many in the amateur radio community would appear to be blasphemy, there are some real advantages lurking in cyberspace. For some time now, internet sites such as QRZ.com, QSL.net, and others have been offering a variety of services to the amateur radio community. One great advance for DXers is a *logbook verification service* offered by QSL.net. If you work a DXpedition and want to make sure you are in their logbook, simply go to the QSL.net web site, find the listing for the DXpedition, then search for your callsign. In that manner you can "instantly" verify that your call appears in the DXpedition's own logbook. I did this with the recent K5K DXpedition and found that my callsign appeared for the two bands on which we worked. This service greatly relieves the anxiety associated with working those "rare ones." After the QSO verification for K5K was made via the internet, all that remained was the sending and receiving the paper QSLs.

Now if you can make an electronic verification right from the DXpedition's own logbook, the next logical step would be to download the entire transaction electronically, saving both time and postage. Using the internet you could include much more information than would traditionally be found on the average QSL card, such as biographical information about the DXers and their equipment, or even a full-color photo of the DXers standing on some far-off atoll. Sounds pretty far out, doesn't it? Well, before you think this is all pie in the sky, let me introduce you to the future.

K5K Log Search results

QSOs with AF1US

Band	Mode
20m	SSB
80m	SSB

A total of 2 QSOs were found

This log contains 80,799 QSOs
from 22-Oct-2000 0320Z through 31-Oct-2000 1848Z

Confirmation on QSL.net of AF1US contact with the K5K DXpedition.

Introducing "eQSL.cc"

At this writing I am aware of only one website that makes the promise of **QSLI** a reality. It is called "eQSL.cc" and can be found by typing <http://www.eqsl.cc> into any web browser. I was introduced to this site by Jim Matis, K2TL.

After logging onto the eQSL site, you can search for any QSL cards left for you by other amateurs. Once you are registered with eQSL (and amateurs in more than 175 countries have done so), you may begin to use the service. The first time I checked into the site I found that six other hams had already left QSLs for me to download. One of these offerings was even a *new* entity (for me), FP/N8KR on the islands of Saint Pierre and Miquelon. I had not yet received the paper QSL, but the electronic card was there, on the screen, and all I had to do was print it!

After downloading and printing my "cards," the next thing was to electronically create an eQSL card of my own. Creating an eQSL is simple; you may use stock images from the eQSL library or create your own card from scratch. You can even upload your present QSL card for use on the website.

I decided to create my own card. Being sentimental about my days in the military, I wanted to use something that really represented my callsign. Thus, I briefly left eQSL.cc to download a photo of Air Force One from a public domain site provided by the Boeing Corporation. Next I typed in all of the appropriate information. The font, color, and size of the type can all be chosen, along with the position of the text on the card. When all was completed, I simply sent out my new eQSLs to the six stations that sent theirs to me and it was done. From start to finish within about 30 minutes **QSLI** had become a reality for AF1US. I had received six QSLs and all were returned via the eQSL.cc website. Postage bill: zero.

While the bureau system of QSLing was created to reduce the cost of mailing hundreds of individual cards back and forth, **QSLI** would seem to be the next logical advance in this regard. **QSLI** replaces the post office or bureau system with an "electronic bureau." It allows QSO information between two amateur stations to be exchanged via the internet. Nothing else about this system would appear to be different.

Currently, I can create a QSL card on my home computer and print it out either on heavy card stock or even plain paper. After printing the card, it may be sent by mail to a DX station across the globe. That DX station then takes my "card" and sends it to an awards manager for verification. With **QSLI** the DX station would simply "download" my card off the internet, print the card himself, and then send it to the manager for verification. The only difference is the time and costs involved in the method of shipping the cards. Eventually an electronic transfer

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could even save the effort of printing and transporting the cards for awards manager consideration.

To further bolster the case for **QSLI** let me point out that even regulatory agencies such as the Federal Communications Commission have no problem with using the internet to conduct business. Changes of address, requests for new callsigns, license renewals, and other information on upgrades and rules all take place via the internet. The FCC actually encourages licensees to use internet filing as a way of speeding up the system and reducing costs. Even venerable institutions such as the Radio Society of Great Britain (RSGB) and the ARRL permit membership renewals and other business to be transacted via the internet. Therefore, in the face of all this, can the **QSLI** revolution be far behind? It would seem a hard case to argue that you may conduct business with a regulatory agency while not being allowed to download your newest QSL conquest via the internet.

Hanging Chads

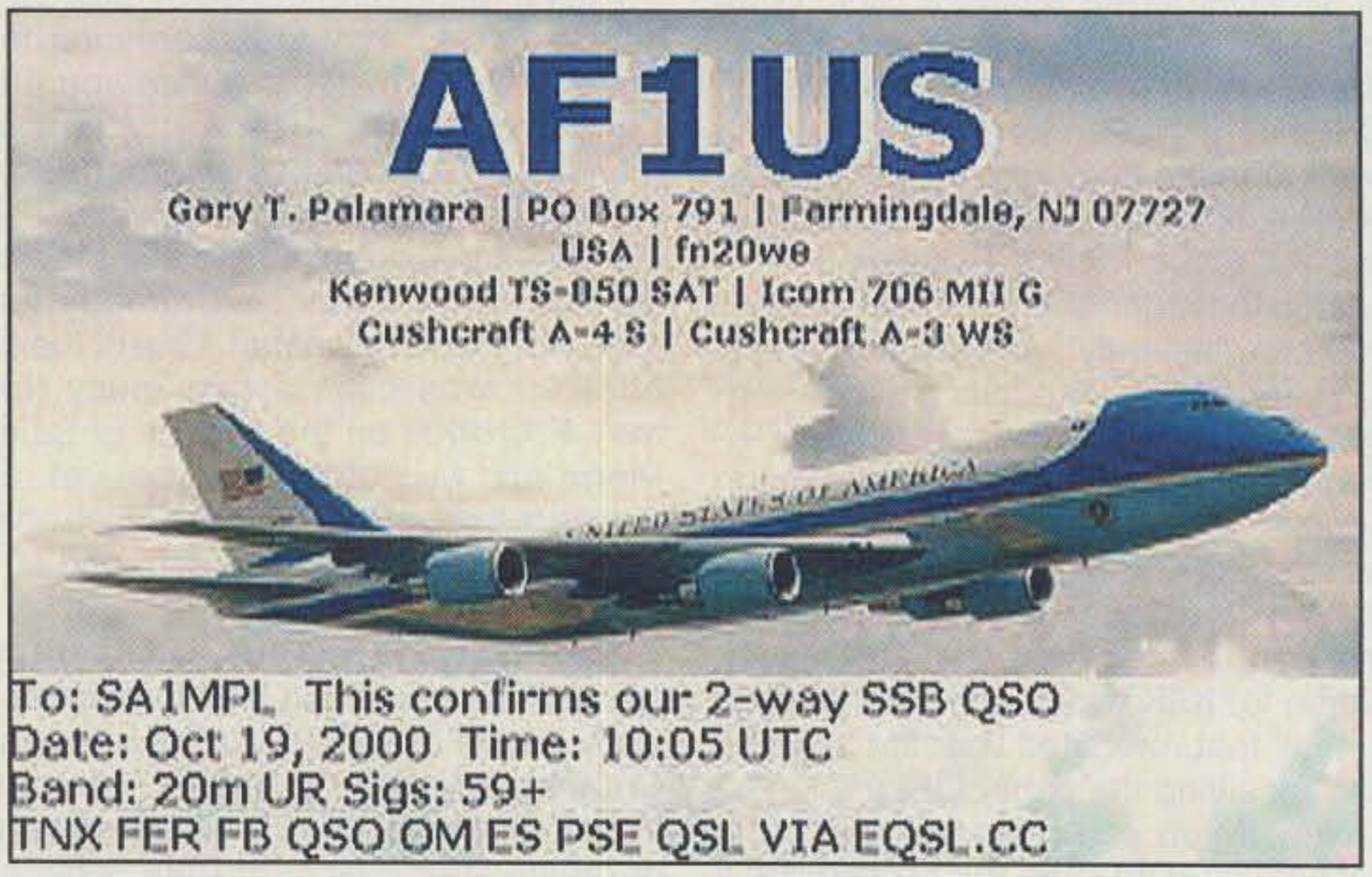
As with changing from paper voter ballots to the "new" punch card system, any advance in QSL technology offers both improved features and potential pitfalls. On the plus side, **QSLI** is virtually instantaneous. From the moment a QSO is completed, a DX station (or even a domestic contact) can be confirmed via **QSLI**. In fact, entire logbooks may be uploaded into sites such as eQSL for the benefit of all that need or want the information. While this sort of transfer of information has been possible for some time now, recent postage rate hikes for domestic and overseas surface mail have made **QSLI** even more attractive.

On the negative side I must admit there is something nostalgically pleasurable about receiving a QSL from some far-off place with all those interesting stamps and postmarks. Professionally printed QSL cards look far better than the ones that come from my inkjet printer (black ink only). However, until now perhaps the largest issue standing in the way of electronic QSLing is the concern about verifying the authenticity of these exchanges and the resulting QSL cards. Awards managers have a right to be skeptical about QSLs that look less than authentic or that have been altered in some way.

One of the other things an amateur from 1960 wouldn't believe about our brave new world is the proliferation of desktop publishing. Using a computer, I can create my own cards for shipping to a DX station, and I could just as easily create the DX station's card for myself (whether or not I worked him)! One thing that was probably just as true in 1960 as it is today: If it is possible to beat the system, there are those folks who will do their best to do just that.

While it is a touchy subject to address, with the vast number of cards already in the QSL system, there must be some that, even today, are less than authentic. Security of the system and authenticity of QSL cards should be a prime concern to all those who participate in awards programs.

There is a layer of protection with printed QSL cards mailed either direct or through the bureau. You have an



AF1US eQSL card, which you might receive if you QSL the author for a contact via the eQSL.cc website.

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actual card filled out by an individual on the other end. Each QSL card looks different from the others submitted in the same stack with an award application. The handwritten or printed QSO information could be scrutinized along with, in some cases, a postmark or manager's seal. To further authenticate the exchange, "check logs" are often provided to awards managers as a courtesy by DXpeditions. All of these checks are very labor intensive but necessary to maintain the integrity of the award system. On the other hand, many major awards programs today permit "field checking" of cards by volunteers and/or a certification by other hams that the applicant is in possession of the necessary cards. It is only at the top levels of these award programs that the manager generally sees any or all of the QSL cards.

In the electronic age verification takes several forms. Let's take the eQSL site as an example. First, you must register and establish a password prior to using the system. Second, after logging onto the system, all traffic must go through the third-party vendor (eQSL, in this case), who authenticates everyone's password each time they log on to the system. Third, the entire database could be opened to awards managers for cross-checking cards electronically. It would seem unlikely that any third-party vendor would have an interest in promoting fraud involving individual amateurs. However, for the ultimate in security, each organization offering awards will most likely want to control its own database. The ARRL is actively studying **QSLI** with the idea of offering it to the membership at some future date.

CQ's award managers are generally supportive of the concept but are waiting to be sure any system is secure and efficient. USA-CA Award Manager Ted Melinosky, K1BV, stipulates that the use of e-QSLs should be entirely voluntary on the part of both sender and receiver, and that he'd reserve the right to randomly verify electronic QSLs with the sending station. Worked All Zones Manager Paul Blumhardt, K5RT, says he'd support electronic QSLs if he could be sure the system was secure and that they wouldn't become an administrative nightmare. CQ DX Award Manager Billy Williams, N4UF, says, "The principle of electronic QSL cards seems to be one whose time is fast approaching," and he is "studying the possibility of allowing electronic QSLs on a limited basis for those applying for the CQ DX Award." However, one expert on secure internet transactions notes that there are no foolproof security systems and "all it would take is one episode of hacking and the (awards') credibility would evaporate."

Is QSLI the Future of QSLing?

Will **QSLI** change QSLing as we know it? Only time will tell. We began this article with a look at a bright new technology that offered increased speed and accuracy to the voting machine industry in the 1960s. Now with 20/20 hindsight, we can see that technology needs to be continually assessed and upgraded to remain viable. In the future we may use the tried-and-true paper method of QSLing or totally switch over to an electronic system, or use a hybrid of the two, or something else we haven't even thought of yet. The options are many.

QSLI presents us with the possibility of overhauling the global system of QSLing for the good of all. It can offer a quantum improvement in both speed and cost while providing similar or perhaps improved verification methods for awards managers. **QSLI** challenges us to look at old problems in a new light and to confront the issues at hand with bold leadership and forward thinking. The next step is agreeing on national and international standards needed for QSLing via the internet. Welcome to the New World of QSLing in Cyberspace.

Footnote: In the late 19th century American inventor Herman Hollerith devised a system of encoding data onto paper cards through a series of punched holes. His system was first used to tabulate the 1890 U.S. Census, and Hollerith's Tabulating Machine Company is still in business today, although with a new name—the International Business Machines Corporation (IBM).

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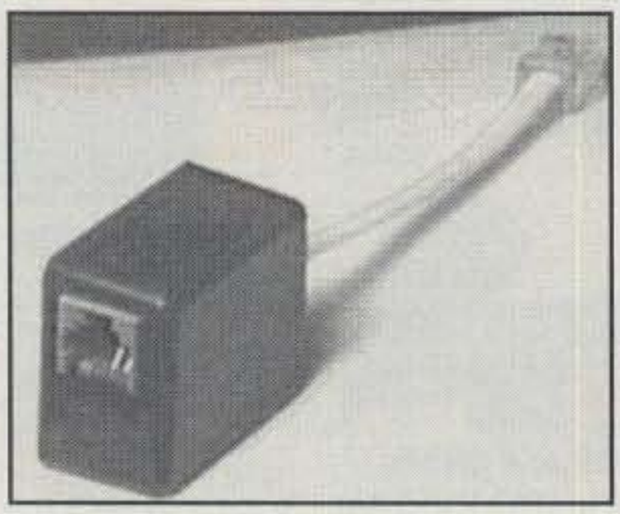

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Earthquake! Amateurs Fill Vital Communications Link

In late January the State of Gujarat in western India was rocked by a 7.7 magnitude earthquake on Republic Day, a day set aside to observe the anniversary of the Indian Republic. There were numerous government events. Businesses and government offices were closed. For many citizens it was a day to stay home. When the earth rattled, quake tremors were felt in neighboring Pakistan and as far away as Nepal. The worst damage was in the area of Bhuj. Here all communication links were down and roads and bridges were damaged. The death toll continued to rise at press time with nearly 20,000 people (as well as some 12,000 cattle) confirmed dead. Large numbers of casualties were reported in Ahmedabad, Gandhinager, and Surat. Some estimates put the death toll over 50,000, since about 800 villages had not been heard from. Life as Indian residents knew it was shattered.

It Started As a Regular Day!

Many hams from Bangalore were at their monthly meeting participating in a flag-hoisting event at the Indian Institute of Hams (VU2IIH) when word came over the HF radio that a major earthquake had struck Gujarat in the western part of the country. That was at 10:30 AM. Most hams had plans for the holiday. Once the earth had moved, most of the hams with HF capability rushed home to monitor further reports and were ready to relay the information on VHF frequencies as others awaited news. Hams from across the country were ready to serve in their country's public interest. By that afternoon the Bangalore Amateur Radio Club (BARC) had assembled a team of five people to travel to Ahmedabad. Although they were ready to travel, they were not able to get plane tickets from the Indian Airlines office and make financial arrangements with groups to sponsor their trip.

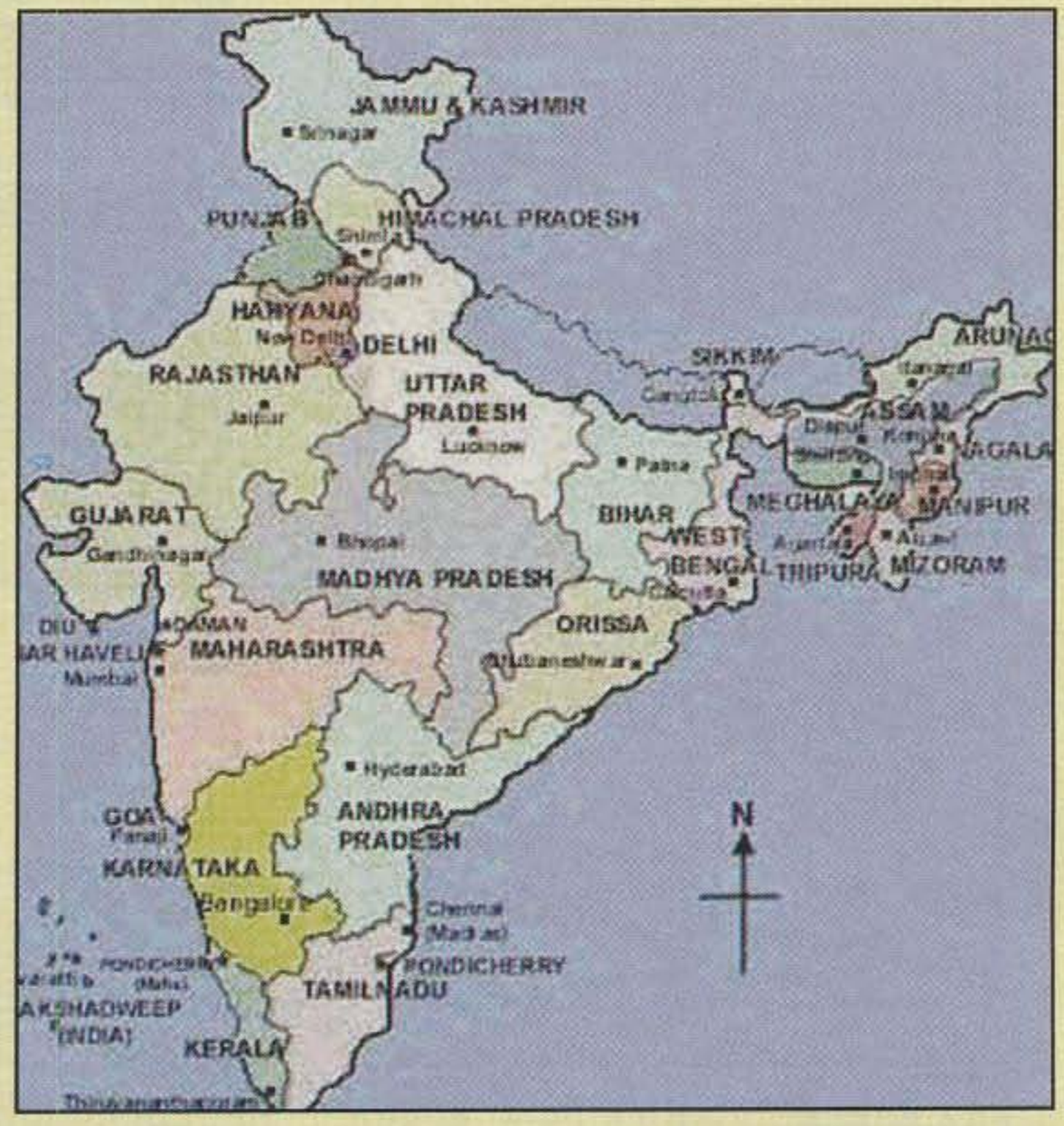
First Word

Horey Majumdar, VU2HFR, told the ARRL that VU2YW was on the air from Ahmedabad, and VU2SL operated from Valsad, some 300 km from Ahmedabad. "There are still no links from Bhuj," he said. Since the disaster took place in western India, many hams from Mumbai (Bombay) in the neighboring state of Maharashtra were moving into the affect.said.

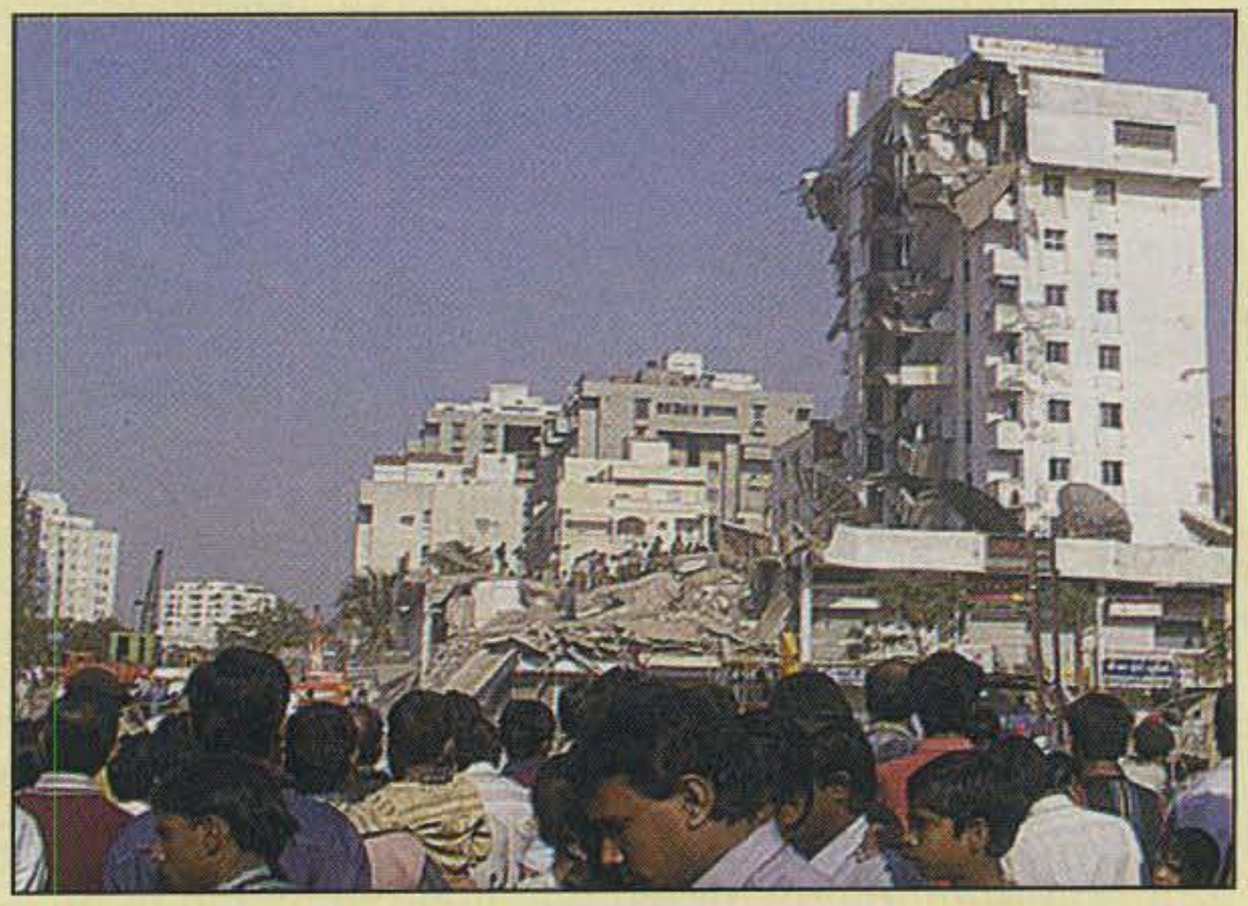
"Here in Calcutta the Calcutta VHF Amateur Radio Society has already started its Calcutta Amateur Radio Control to cater to anxious relatives and friends who are desperate to hear about the well-being of their near and dear ones," he said. Ham radio remained among the primary information links with the affected region. The *Times of India* reported that ham radio was considered to be "the second order radio communication."

Hams Join Relief Teams

By the next day the Karnataka government had decided to send a team of doctors to Ahmedabad. BARC members



Hams respond to devastating earthquake. Courtesy American Red Cross. (Photo via the VU2KOC website)



Communications were knocked out in cities and towns destroyed by a massive earthquake. (Photo by Rabindran Shelley, World Relief Staff)

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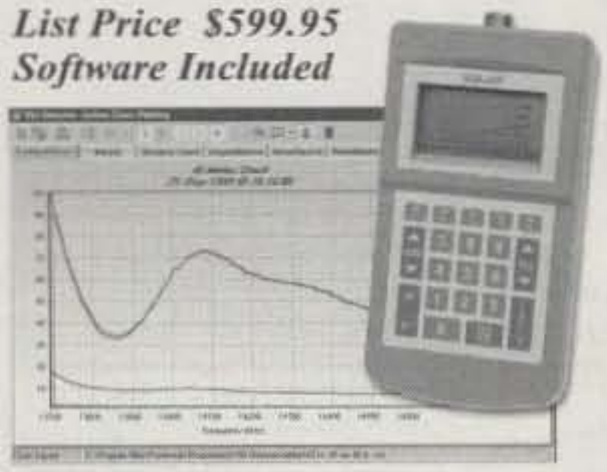
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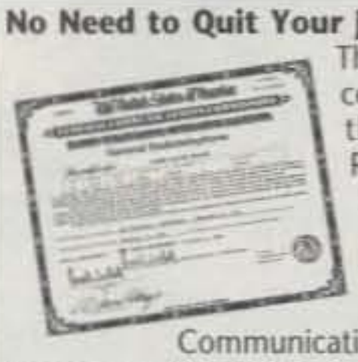
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Many towns were completely destroyed by the earthquake that struck western India. Chandru Ramachandra, VU2RCR, visited the town of Bachao, 30 km from the epicenter. Thousands of people and animals were killed. (Photo courtesy Dr. T Venkatesh, St. Johns, Bangalore)

Children played amongst the rubble of their homes. Meanwhile, hams supplied emergency communications until telephone service could be restored. (Photo courtesy the Red Cross)

impressed upon them the role of ham radio. Sandeep Shah, VU3SXE, was included in the team. They reached Ahmedabad, Gandhinagar, one of the hardest hit areas. Communications were established back to Bangalore.

Concerned friends and family members were trying to find out information about their relatives any way they could. Several message boards appeared on the internet. "Does anyone have any news about Ahmedabad?" A reply came back. "Hospital has standing room only," wrote an unidentified ham radio operator. "Multi-story near Beedi-wala Park damaged and about ten feared dead," he added. The Gujarat Information Center in New Delhi said that a network of ham radio operators had been set up in Anjar, Bachau, Bhuj, and Gandhinagar. The amateur radio station at the Department of Science and Technology, New Delhi, would help people obtain information about friends and family in Gujarat.

Raj Kumar, VU2ZAP, of Bangalore told *CQ*, "We now have a group of twelve hams from Bangalore, eight from Mumbai (Bombay), eight from Hyderabad, two from Baroda" helping out. "Hams are volunteering in droves. I hear that there is a whole batch of hams in Ahmedabad awaiting deployment to various locations. Hams have also accompanied teams of orthopedic and casualty doctors from various cities. Radio relief communication is on 40 and 20 meters; separate frequencies are in use for different cities with one netting frequency."

Travel Difficult

Travel to the disaster area was never easy. Most hams in India cannot afford to take a week off from work, let alone

pay to travel across the country. While the government made arrangements for some free transportation by train, the operators were limited to carrying radio equipment. There were no provisions for carrying food and water. These supplies would have to be obtained in the disaster area. The Amateur Radio Society of India (ARSI) attempted to help out the hams. ARSI Secretary Adolf Shepherd, VU2AF, in Bombay described the need for money in one word—*logistics.*

"We need (money) to provide the hams with local material which can't be individually carried. Radio equipment is manageable at this point in time." [However, there is a need for] "portable water/food, fuel for generators, and transporting it to quake affected areas." According to Raj, VU2ZAP, "Most of the amateurs in VU are not affluent enough to be able to afford transport to a far-off place. We can't permit them to make a dent in the family budget even after they are willing to lose pay to do this work… We need to send replacements every week or ten days," Raj added. "Living in rough conditions away from families, among death and destruction, can be very destructive on the mind and break the spirit." According to VU2AF, surplus funds will be used to provide relief for the disaster victims and to enhance disaster-handling abilities if needed.

Two Levels of Activity

VU2ZAP described two levels of amateur communications. First the hams provided communications for the district administrations that were organizing the relief efforts. Second they helped with welfare inquiries. "People are requesting info about the welfare of their families from all over India and abroad. Hams are contacting their families and relaying back their welfare and whereabouts. We are being swamped with hundreds of requests every day. What is hampering the hams in their efforts in the earthquake-hit cities is the lack of mobility and mobiles. Most of these earthquake-affected towns are flattened and there are no street signs and sometimes no trace of the cities! Survivors of flattened homes/condos may not be there anymore. They are camping outdoors, so finding them is a problem. A heart-wrenching situation."

In the Town of Patan

One medical team moved to Patan in the state of Gujarat and took charge of emergency medical care while Sandeep, VU3SXE, and Susheel, VU2LFA, established the HF radio link. The next

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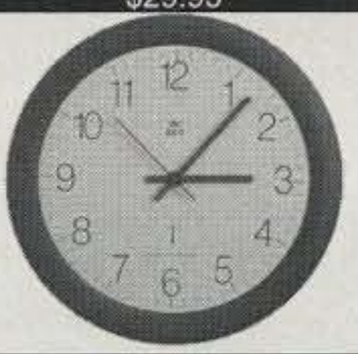

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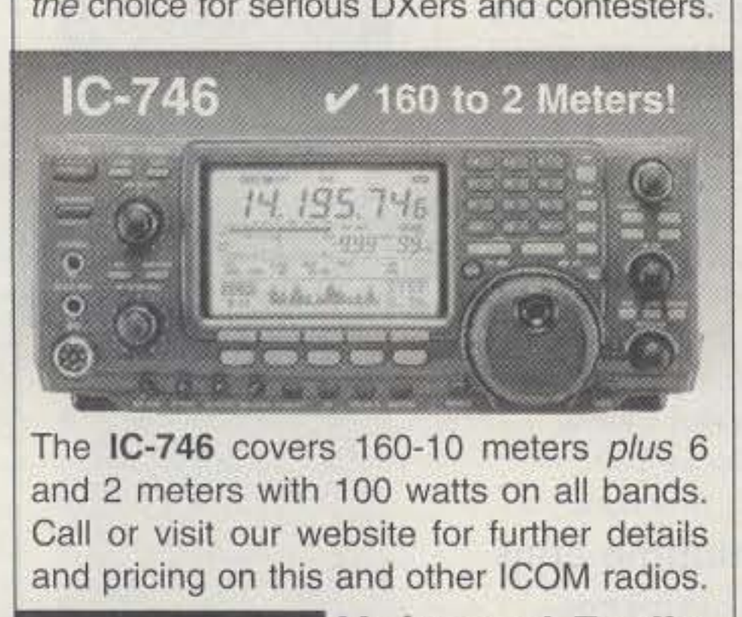

team of doctors had Doc Venkatesh, VU2COC, on the team but could not board the plane at the last minute because of some confusion at the airport. Meanwhile, the local Gujarathi Association (religious) could get tickets for four on the same flight. Four other hams boarded a relief train and took charge of the drug relief from the government of Karnataka. A damage assessment that was done by the team was passed on to medical authorities. S. B. Ram, VU2LIC, established an amateur radio net-control point in the residence of Gujarat's chief minister. Fifty other hams "operated around the clock" throughout the affected region—including the hard-hit city of Bhuj.

A Week Later and Still Going

A week later 18 amateurs from Karnataka were still providing emergency communications regarding the movement of doctors and medical and relief materials. They were also trying to help with information on the health of friends and family in remote places where the phones were still not working. Amateurs from other cities, including Mumbai and Bangalore, were also helping.

"The ham operations have become very useful, and all the media are reporting about hams working in the area in almost every bulletin," D.V.R.K. Murthy, VU2DVO, said. He said the National Institute of Amateur Radio in India (NIAR) also has heard from hams in the US, Japan, and Turkey who offered to come to India to assist or to send a donation. "We advise them that they can come and work with the equipment provided by NIAR and with its teams," he said. Waiting for government permission to operate their own gear could "take some time," he said.

There's been a downside to the favorable amateur radio publicity, however. B. L. Manohar, VU2UR, in Bangalore, says media reports about ham radio's presence in the quake zone have led to a flurry of calls from all over India asking hams to radio the affected region for information on friends and loved ones.

"Most of the amateur radio operators manning the stations in Gujarat do not know the local language (Kutchchi/Gujarati) or the streets and areas of the city where they have stations established," he said. "With no help in the form of local people to run about, all such messages are getting piled up." That has led to some backlash aimed at the amateur community, Manohar said.

The *Times of India* told a story about the grim situation in Anjar. The ham radio reports said, "Sorry, can't find out immediately because no one is staying in buildings. Most buildings are razed or are uninhabitable. All the people here are staying in 30 to 40 relief camps." Other news indicated that another family's relatives were doing okay and only had minor injuries. With such a major disaster the only thing the families wanted to hear was that so and so was okay.

DX Stations a Problem

Majumdar said DX QRM on 20 meters hampered the handling of amateur radio traffic on 14.155 and 14.160 MHz. "VU hams would be grateful if DX stations could keep the frequency clear," he said. "Cooperation and consideration from DX stations would be much appreciated," Majumdar said.

A request to provide some elbow room for emergency traffic at 14.160 MHz also came from NIAR Director and Executive Vice Chairman S. Suri, VU2MY. Majumdar said there was a lot of emergency activity on VHF as well. "Stations all across India are participating in the emergency traffic," he said, "checking into the net frequencies and relaying information." (The US and India do not have a third-party traffic agreement allowing hams to exchange messages on behalf of a third party or non-ham.)

Hams Do It Again!

Amateur radio operators have a long history of providing communications in times of need. "This has become a practical exam showing our capability and preparedness in disaster management," said Lion Ajoy, VU2JHM, president of the Bangalore Amateur Radio Club. "We anticipate that the government and non-governmental organizations will support us by establishing, equipping, and training such emergency search-and-rescue teams for such disasters as a part of our preparedness to face such unwanted calamities." He continued, "The Government of India has empowered every district in the country with special provisions to utilize amateur [ham] radio service [in the event of] natural calamities, such as earthquakes, floods, cyclones, and widespread fire, which cause failure of normal telecommunication facilities."

Tennessee Hams Try to Help ... Bureaucracy Blocks Aid

Shortly after the earthquake struck, Bill Dickert, KD4EKZ, received a message from a good friend and fellow member of the Chattanooga Amateur Radio

Club, Pradeep Bakshi, VU2PCD, in Vadodara, Gujarat, India. He and several members of his local club, the Baroda Radio Amateur Club, had been asked to mobilize and provide emergency communication in the Bhuj area of Gujarat. Mobile operation is not generally allowed in India and none of the local hams had mobile HF antennas.

Pradeep said, "A team of hams from Bombay has reached there with VHF gear, but HF gear is still scarce. We could not find any HF mobile antennas, though. Hams stop their vehicles, unfold a 40 meter dipole, hold it as high as they can, and exchange short messages before their hands start aching!!" Dickert offered to try to locate mobile HF antennas to ship over for the use of hams in Vadodara, and Pradeep agreed that the effort would be greatly appreciated. Ham dealer C. T. Morgan and Associates in Chattanooga had four 40 meter and four 20 meter HF verticals along with matching triple-magnet mounts. Pradeep said the antennas would fill the need perfectly.

Dr. Joravarsinh Sarvaiya, VU2HBZ, Dr. Bakshi's associate, e-mailed Dickert: "HF mobile antennas are very much needed. As far as custom duty is cornered, the message is being continuously scrolled on all TV channels here that all relief material will be exempted from Custom and Excise duty. You may send the material with sufficient number of labels on cartons bearing 'URGENT: For Relief Rescue Operations in Earthquake hit area in GUJARAT' through fastest possible courier."

A second message was received: "Kindly send material at destination AHMEDABAD, GUJARAT airport. Many airlines have offered free air lifting of relief material (I am sure about Air India); kindly explore this possibility. Material should be split and sent to VU2HBZ and VU2PCD at AHMEDABAD, (Gujurat, India) airport."

Five days after the earthquake Dickert was able to begin making arrangements to ship the antennas to India. Dickert picks up the story here...

I contacted Air India that day and was referred to the Embassy of India in Washington. After several unanswered phone calls and a fax on the 31st, a spokesman at the Embassy of India referred me to the Indian Consulate in Chicago. I was given a consulate staff member's name, phone, and a fax number there. After two additional days of phone/fax tag, finally I spoke to a member of the Consulate staff on Friday, February 2nd. This person told me that they were shipping via Air India and that we should bring the items, along with their "Authorization," to the Air India Air Cargo office at Chicago's O'Hare Airport.

As requested by the Consulate staff member, for the next two days, February 3rd and 4th, I called the numbers given at the Consulate and left messages trying to get the "authorization" papers. There was no response from the Consulate. On Monday the CARC Secretary contacted the offices of Congressman Zach Wamp for assistance. Congressman Wamp's office was able to contact the Consulate in Chicago on our behalf.

Finally on February 5th I did receive by fax, the official "authorization" forms, which directed me to ship the antennas, not to Drs. Bakshi and Sarvaiya in Ahmedabad as requested, but to the Chief Secretary, Government of the State of Gujarat in Gandhinagar, Gujurat, India. When I called the Consulate about this discrepancy, I was told that all relief supplies must be shipped to this office. I was also told that the Drs. Bakshi and Sarvaiya must "liase" with the Chief Secretary's Office in order to obtain the antennas for use.

I contacted Pradeep for advice. He replied: "Bill, just call it off. This way we will never receive the stuff. There is no way I will liase with govt. officials. It is impossible to work with those guys and I will have to drive to Gandhinagar (3 1/2 hrs each way) whenever they call me for a meeting to clear the stuff. I know how frustrating it is for you, as it is for us over here. We heartily appreciate and thank you for your efforts....73, Pradeep."

With Many Thanks

A major earthquake occurs half a world away from the eastern United States, yet thanks to the world of ham radio and the internet we are able to bring this story to you. I want to thank VU2ZAP, KD4EKZ, and many other Indian amateurs for posting news on the web and sending reports to us following the earthquake.

Do you have a story to tell? Drop us a note. Until next time...

73, Bob, WA3PZO

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Amateur Satellites

BY PHILIP CHIEN, KC4YER

Ham Radio in Space

DXing 12 Million Miles

The December "Amateur Satellites" column talked about satellites that use ham frequencies but aren't open to the amateur radio community. Here's a twist: A government satellite that just happens to use ham frequencies.

NASA's 2001 Mars Odyssey spacecraft has a UHF relay in the 70 centimeter ham band. *(It's not an amateur allocation on Mars!—ed.)* It's designed to communicate with smaller spacecraft exploring Mars, such as rovers, balloons, and airplanes. It's much more efficient for a small spacecraft on the Martian surface to relay its telemetry and scientific data up to a spacecraft in orbit around Mars and then use that spacecraft's much more powerful transmitter and directional antennas to relay the data back to the Earth. The technique was used successfully with the Viking 1 and 2 landers and orbiters. Since then, each spacecraft sent to orbit Mars has carried a relay for use with later spacecraft.

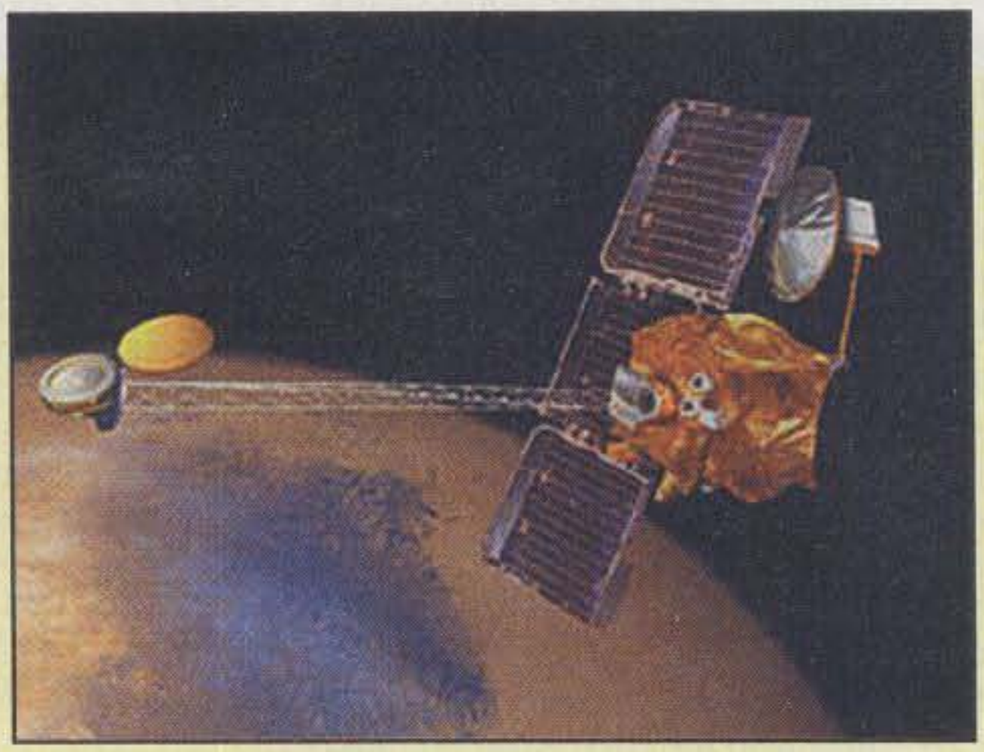
So far the relays haven't been used, but not because of any problems with them. The U.S. Mars Observer, Russian Mars 96, and U.S. Mars Climate Orbiter spacecraft all were failures. Mars Global Surveyor has been an incredible success story, and its relay is active. However, it doesn't have anything to talk to due to the failures of the Mars Polar Lander spacecraft and twin Deep Space 2 microprobes.

As with several of the previous Mars orbiters, NASA plans to test out the instruments after launch using the Earth as a calibration target. Unfortunately, due to the extremely southern declination for the launch, it will be two months before Mars 2001 is visible from the prime site at Stanford University in northern California. By that time the spacecraft will be 20 million kilometers, or 12.4 million miles, from Earth—a world record for the longest DX contact!

Mars 2001 does have a more powerful transceiver than the previous relays, which will help compensate for the additional distance. The system will have a gain of 0 to a few dBi with 10 to 12 watts of power. It will transmit on a frequency of 437.100 MHz and use a quadrifilar helix antenna with right-hand circular polarization. The test will check out the CW and PSK modes from the primary site, Stanford University's 40 meter dish.

In addition, amateurs with moonbounce-class stations are encouraged to participate. The team would appreciate it if you could provide your location, type of antenna, system gain, system noise temperature performance, and back-end description (DSP, bandwidth, etc.) of your system. In theory, an OSCAR-Class ground station (22-element Yagi) can receive the signal using sophisticated digital signal processing techniques.

If you're interested but aren't already equipped with a moonbounce-quality antenna system, one approach is to build an inexpensive antenna for the test. Mike Cook, A9FY, designed a helix antenna made from PVC tubing and refrigerator copper tubing. Total cost was under $50, making it a practical approach if you've got the mechanical skills. The SETI League's website (see "Resources") includes some excellent spreadsheets for calculating link margins for extreme distances, although their targets are at distances measured in light years—far more than "mere"millions of kilometers!



Artist's conception of the Mars Odyssey orbiter flying above the red planet. Hams will be able to try to tune in a test of the Odyssey's space-to-ground (Mars ground) relay transmitter, which operates on the 70 cm ham band. (NASA drawing)

Therefore, if you want to try to set the world record for DX distance for the reception of a signal on a ham radio band, here's your opportunity. Relay test manager Dr. John Callas said, "The best chance will simply be to detect the CW signal, when present."

Mars 2001 Space Odyssey is scheduled for launch on April 7, 2001 at 11:02:22 a.m. EDT (15:02:22 UTC). It will fly on a Delta 7925 launch vehicle, the same type used for Mars Global Surveyor and Mars Pathfinder. The Delta originally was derived from the Thor Intermediate Range Missile and was never intended to launch interplanetary spacecraft. Its software and first-stage engine do not support "yaw steering," so it has to launch in a fixed, predetermined direction. Consequently, it has an instantaneous launch window, giving no opportunity to wait out bad weather or solve last-second technical problems. Engineers can load an alternate launch time into the computer on the launch day so there are two instantaneous launch windows each day. Even with all of these restrictions, most Deltas get off on the first or second try. Which day launch occurs will determine how long it will take before the spacecraft is visible from Stanford and the exact distance.

It's an extremely difficult challenge to receive a signal from a distance of 20 million kilometers with an amateur antenna, but an incredible accomplishment if you can do it.

Space Station News

By the time you read this article, the second space station Expedition crew should be settling into their home in space and the first crew will be back on Earth. We are planning to bring you interviews with all three crew members in next month's *CQ*.

779 Merritt Island Causeway #808, Merritt Island, FL 32952
e-mail: <kc4yer@cq-amateur-radio.com>

A 5 foot prototype of the 10 foot helix antenna designed by Mike Cook, AF9Y, from PVC pipe and copper tubing that might help you tune in the Mars Orbiter relay test. Construction details and instructions are on Mike's website (see box). (Photo courtesy Mike Cook, AF9Y)

So far ham radio activity from space station Alpha has been a mixture of success and disappointment. The ham radio rig was set up and tested within a couple of weeks after the crew arrived. Crew members immediately started to use it for unofficial personal contacts with their families. Many hams reported hearing astronaut Bill "Shep" Shepherd, KD5GSL, talking to his wife about doing their taxes and his raising their new puppy by "remote control." These family contacts take place on unpublished frequencies. However, like any other ham radio communications, they are not private and anybody who comes across a conversation is welcome to listen in.

The key reason for having amateur radio on the space station is education and outreach. On December 19th Bill Shepherd attempted to contact the Burbank School in Burbank, Illinois. But while many hams heard the space station call the school throughout the pass, the school never got a signal up to Alpha. It turned out that there was a problem in the school's station which prevented the contact. Two days later the contact was rescheduled and extremely successful. Seventeen students asked Shep questions and received very informative answers. While all of the students were interested, none of them had the courage to ask the question everybody wanted to ask. Thus, control operator Charlie Sufana, AJ9N, asked, "How do you go to the restroom?" Shep's response was "Well, actually the toilet up here works very well. It's a lot like you'd have on a camping trip—a camper or maybe on a boat out at sea. And it's something the Russians have designed. It has been working well for us now. I'd say it is one of the better systems we have on board."

School contacts have been a regular part of Bill Shepherd's schedule, with an average of about one contact each week. On the other hand, however, random contacts with hams around the world have been extremely scarce. While the crew is very busy, it does have free time during the weekends, and it came as a surprise to many that the crew hasn't been heard on the radio more often.

Meanwhile, the ARISS hardware team has been working on several improvements to the on-orbit hardware. The backup transceiver from Mir is under consideration. In the U.S., hams are building an interface from the radio to the computer for slow-scan television. In addition, cosmonauts and astronauts are training to install the long-awaited external antennas on the aft end of the Service Module. These antennas will operate at HF, VHF, UHF, and microwave frequencies. They're a true international effort with pieces developed in the U.S., Russia, and Italy.

Sunsat (SO-35) SK

The South African team responsible for Sunsat OSCAR 35 has reported that they've given up trying to contact their mini-satellite. The last communication was on January 19, 2001, just under two years after its launch from Vandenberg Air Force Base in California. Sunsat was launched on February 23, 1999 as a secondary payload with the Danish Orsted mini-satellite and the primary payload, the US Air Force Argos spacecraft.

Sunsat was the very first South African satellite and more than exceeded all of its goals. As an amateur radio satellite, it operated as an FM transceiver, permitting DX contacts with handheld dual-band radios. It also included high-resolution imaging capabilities and a GPS (Global Positioning System) experiment, and helped promote education and space research in South Africa.

What caused Sunsat to fail will probably never be known with any certainty. The team believes the most likely causes are multiple failures or a burst battery cell. In any case, the mission was an excellent success and an excellent example for how a country with no space experience can build its first satellite.

"Houston, We Have a CD..."

Finally this month, something that has nothing to do with ham radio, but still is rather interesting. NASA's history office has created a two-CD set with the transcripts of all of the air-to-ground communications from every Mercury, Gemini, and Apollo mission through Apollo 17. The original hardcopy transcripts were scanned, converted to PDF format, and written onto CD ROMs. You can read pieces of history with the astronauts describing their activities or even just joking with flight controllers.

The best part is the price—just the cost of a self-addressed, stamped, padded envelope with enough postage ($1.90 for U.S. addresses) as long as supplies last. Send your envelope to: NASA SP-2000-4602, the NASA Headquarters Information Center, Mail Code CI-4, 300 E Street SW, Room 1H23, Washington, D.C. 20546-0001.

Internet Resources

Official web page for the Mars 2001 UHF relay test: <http://mars.jpl.nasa.gov/UHF>.

Mike Cook's web page with instructions for building a long helix antenna: <http://www.webcom.com/af9y/helix.htm>.

SETI League spreadsheets: <http://www.setileague.org/software/spreadsh.htm>.

Stanford University web page on the Mars Global Surveyor's relay test in 1996: <http://nova.stanford.edu/projects/relay/>.

E-mail list for participants in the Mars relay test: "MARS-NET" e-mail reflector, which will discuss the Mars Relay test. Update notices will also be sent through the e-mail reflector. To subscribe, send a message to: <Listserv@VM.StLawU.edu> with the message: "Subscribe MARS-NET (Your-Name) (Your-Callsign)—for example: Subscribe MARS-NET Robert R. Smith N6JK. To submit messages to the MARS-NET reflector, address your e-mail message to: <MARS-NET@VM.StLawU.edu>.

URL for first ARISS school contact: <http://www.burbank.k12.il.us/Schools/Burbank/newsletters/iss/>.

For more information on SUNSAT: <http://www.sunsat.ee.sun.ac.za>.

World Of Ideas

A Look At The World Around Us

BY DAVE INGRAM, K4TWJ

Mobiling on the Mind

Spring, summer, and another fun-filled mobiling season are once again headed our way, and this one promises to be an absolute winner. Sunspot Cycle 23 is peaking, all the HF bands are jumping with joy, and DXing is superb—even while mobiling with only a mild-mannered setup! Whether you like operating from a quiet back road, from a shopping-mall parking lot, or from a boat on a lake—or are simply following others doing the mobile scene—now, right now, is the time to be on the air. Yes, and you only need a 100 watt transceiver and basic antenna to enjoy such free-spirit hamming.

Need more inspiration? This month's column starts off by putting you right in the driver's seat traveling our country's famous Route 66. It then brings in some antenna news and ideas I am sure you will appreciate. Next month will be more details on first-class mobiling, views of maritime mobiling, and more. Overall it promises to be most informative, so settle back and start thinking about new-millennium mobiling!

Photo A– This glitzy "Route 66 On The Air" certificate was available to all radio amateurs contacting one or more special-event stations operating from well-known cities and landmarks along Route 66. It was a "mental mobile experience" of the best kind, and a return 75-year anniversary of Route 66 operation is planned for later this year. Don't miss it! (Certificate courtesy North Arizona DX Association)

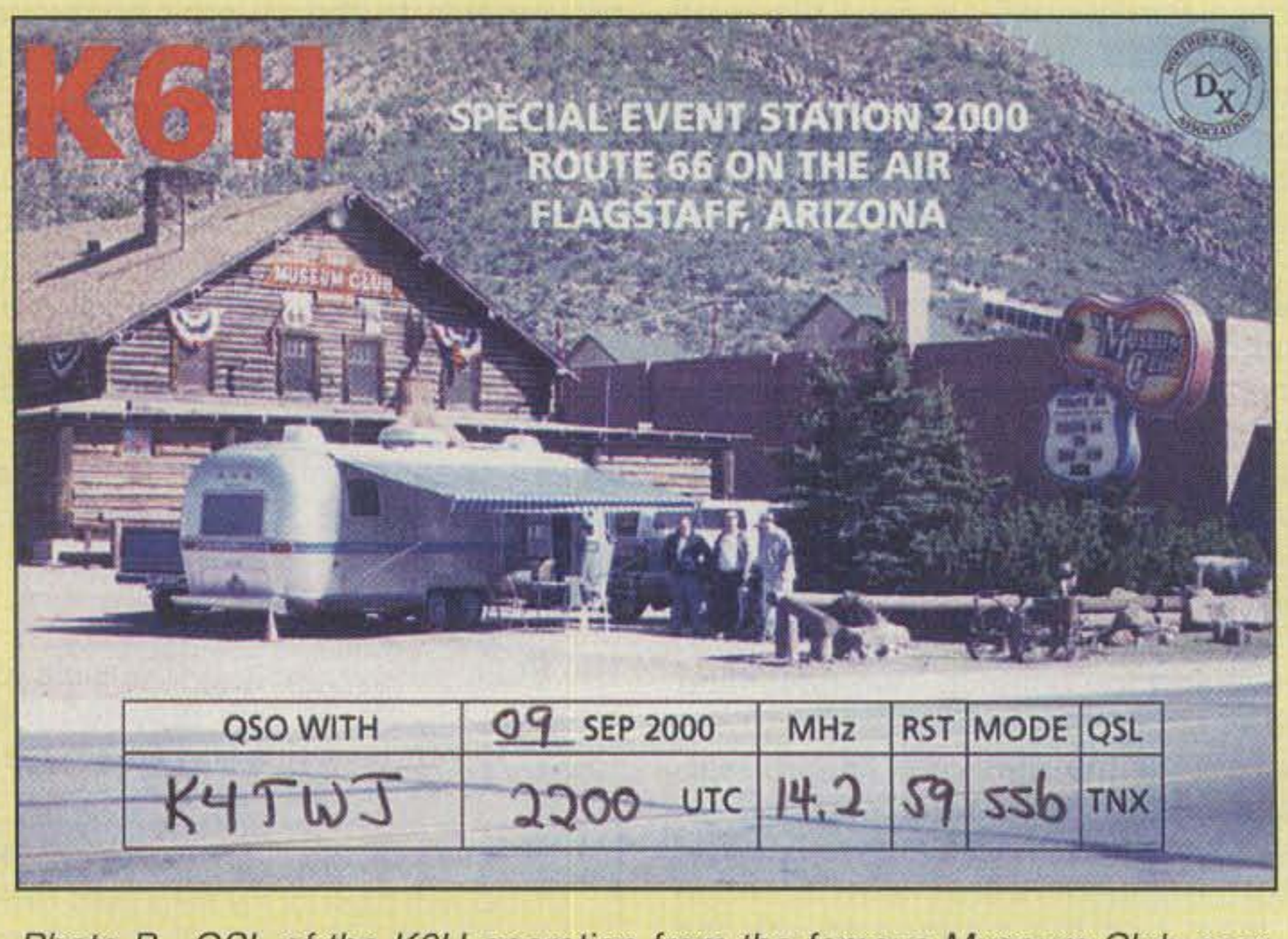


Photo B– QSL of the K6H operation from the famous Museum Club near Flagstaff, Arizona on Route 66. Operators included K6TIM, KA7TDH, KI7LS, KJ7WY, NE7I, NN7A, W7ST, and W7YS. (QSL courtesy NN7A)

Traveling Route 66

If you were on the air in mid-September 2000, you probably heard (and hopefully worked!) some of the 12 special-event stations operating 80 through 10 meters with the three letter calls of K6A through K6L. The stations were set up at various sites along Route 66, our country's famous "Mother Road" that runs from Chicago, Illinois to Los Angeles, California. The 12 operating sites coincided with the 12 cities or towns highlighted in the classic Bobby Troup song "Get Your Kicks on Route 66."

If you worked at least one of the stations, you qualified for a snazzy "Route 66 On The Air" certificate offered by the Northern Arizona DX Association (P.O. Box 201, Flagstaff, AZ 86002 <www.nadxa.com>). If you worked more than one Route 66 station, the certificate was endorsed/stamped to acknowledge your additional contacts, as shown in photo A. The event was organized and coordinated by the NADXA, with a dozen clubs and several members of each club conducting on-the-air operations in their respective areas (Table I). In addition to the (NADXA-sponsored) Route 66 On-The-Air certificate, each club also offered special Route 66 QSLs (photo B). It was a blowout exciting affair, and the resultant atmosphere was like actually mobiling along this legendary highway right from your home via amateur radio. It was fantastic! We understand a return-visit operation is slated for the 75th anniversary of Route 66 during September 2001. This time a

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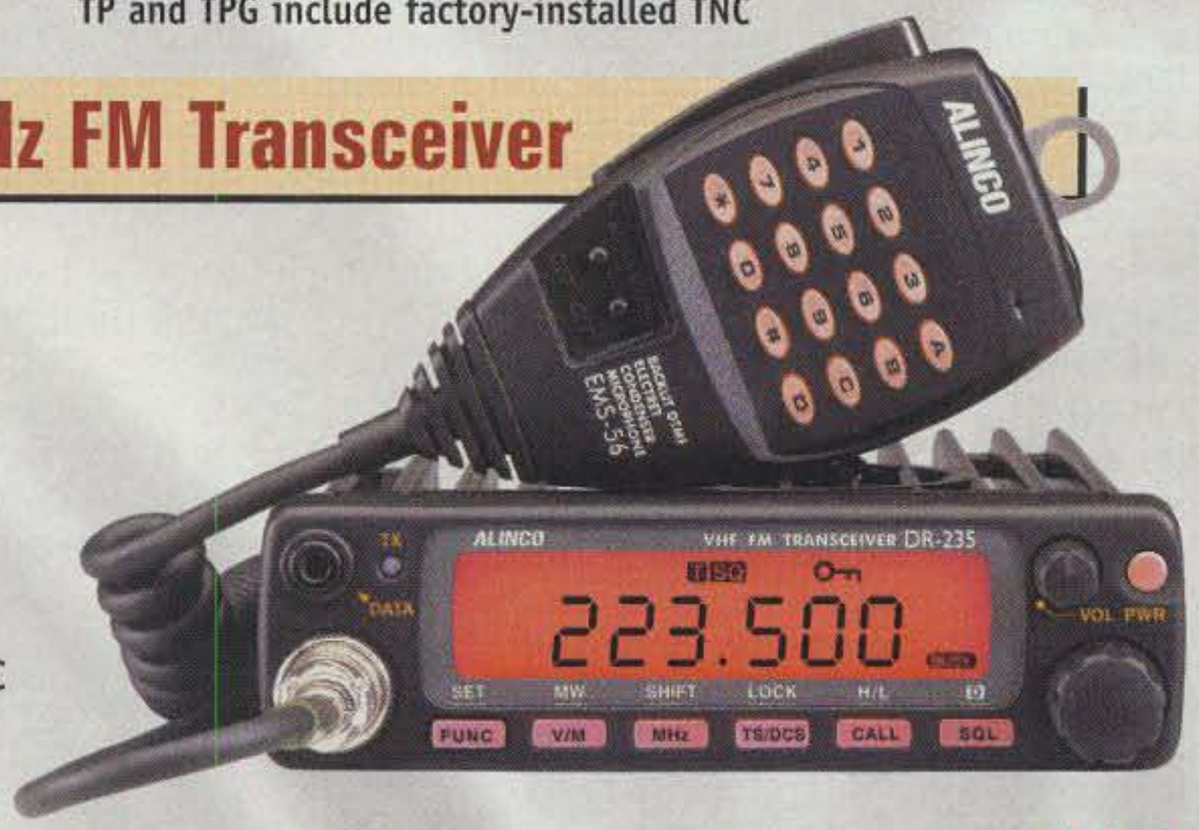

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Photo C– A closer look at the Museum Club's road sign on the right side of photo B tells the story in high style. Big-time action for sure! (Photo courtesy NF7E)

mobile station traveling Route 66 and signing K6M is also scheduled to be included in the operation. If you missed last year's event, be sure to catch the 75th anniversary of Route 66 operation in September. You'll love it!

Route 66 covers more than 2000 miles and passes through eight states plus several areas of national interest. It has been highlighted in novels such as *The Grapes of Wrath,* by John Steinbeck (1937), featured in classic TV shows such as "Route 66" (1960–1964), and the song "Get Your Kicks On Route 66" has been recorded by over 112 artists in numerous styles. Route 66 was dedicated as an official US highway in 1926, with paving mostly completed by 1932. That same year many folks traveled the new highway to attend the Olympic Games in Los Angeles.

Route 66 was the "bright lights and glamour road" of the heartland and the Southwest until the mid to late 1960s. Then our growing interstate/freeway system overshadowed and bypassed it section-by-section. Williams, Arizona was the final Route 66 town to be bypassed (1984). Today only short segments of that legendary road remain in service. It has been replaced by freeways I-40, I-44, I-55, I-15, and I-10.

The road will live on in our memories in (hopefully!) continuing on-the-air operations by star-struck amateurs and in a famous line of clothing that, like Route 66, is truly American all the way! Watch *CQ* for an announcement of times and frequencies of Route 66 operation for 2001. Maybe this year even souvenirs or T-shirts will be available for a fair price. I *assume* the event will again be held in September. Last year's main web site for information was <www.nadxa.com>.

Photos C, D, and E are some views of Route 66 and related special-event stations K6N and K6G. Thanks, gang, for a superb operation. It is events such as this which place amateur radio 10 dB above all other electronic-related hobbies and pursuits!

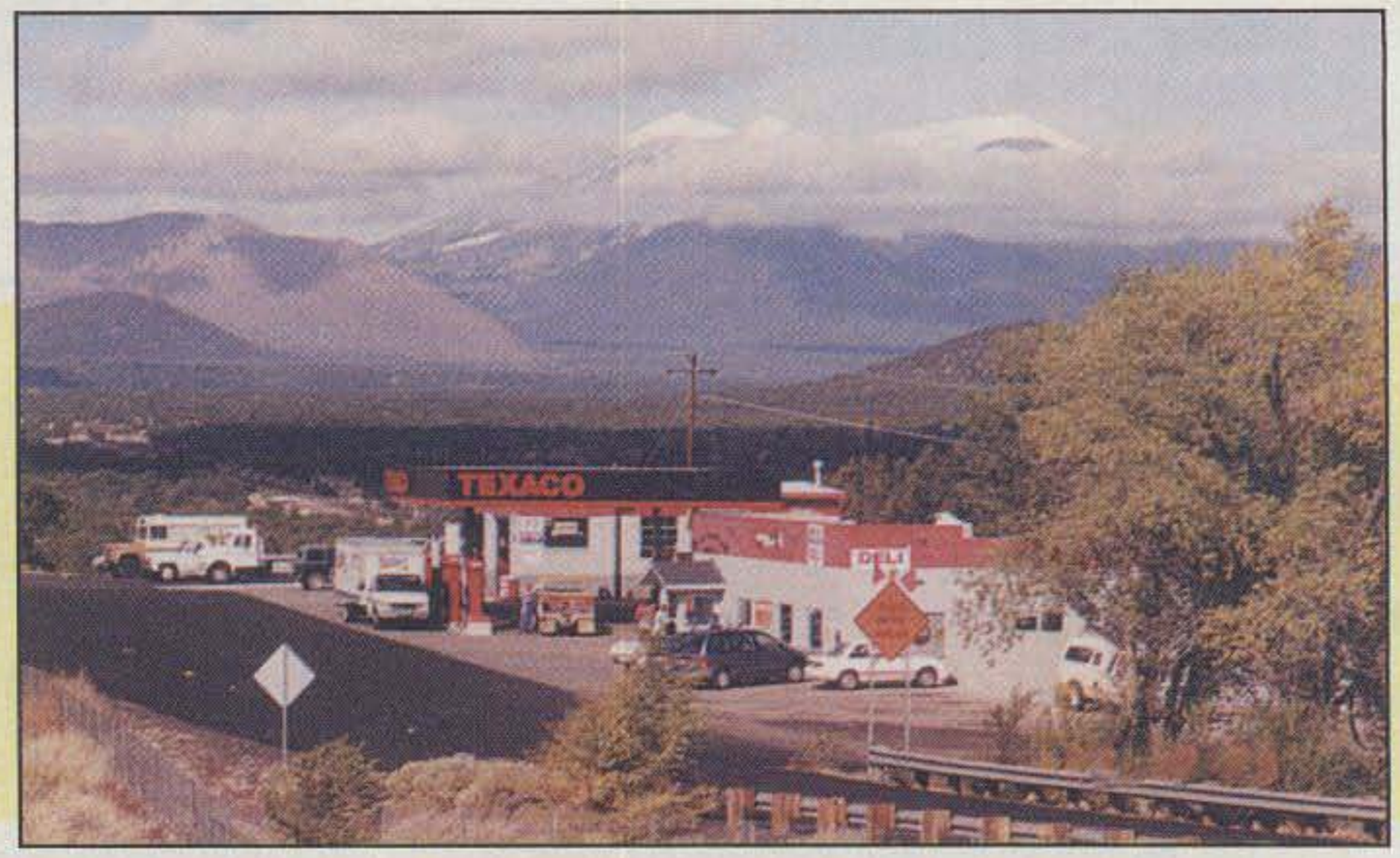

Photo D– This view of the Winona (Arizona) Trading Post and Texaco service station on Route 66 was overlaid with QSO data like the K6H card and became the photo QSL for K6G. Operation was from a camper shaded by trees to the right of the building. Spectacular views such as this are why Route 66 is so famous! (Photo courtesy W7ST)

New MFJ Mobile Antenna

Did the Route 66 event kindle thoughts of pursuing your own mobile ventures? That's the spirit! Need a good, low-cost monoband whip antenna to get you rolling in high style? Well, friends, check out the new line of stouthearted "Ham-Tennas" from MFJ Enterprises shown in photo F. The antennas are available for each HF band between 75 and 6 meters, and they are slim and clean, easy to set up and tune, and almost 8 feet tall to yield maximum possible signal radiation.

The antenna's lower 4 foot section is black-vinyl-covered fiberglass with a helically-wound radiator and a weather-protected loading coil for a specific band. The upper section of "stinger" is a stainless-steel whip. You insert it approximately 1.5 inches into the lower section for operation, or slide it all the way in (up to its tip) for easy storage when not in use. Set screws hold the whip in place, and a chrome-plated brass fitting with standard 3/8 by 24 threads on the bottom secures the antenna in a mount.

MFJ has you covered there, too, with a clamp-on model 345 trunk-lip/hatchback mount or a pipe mirror bracket

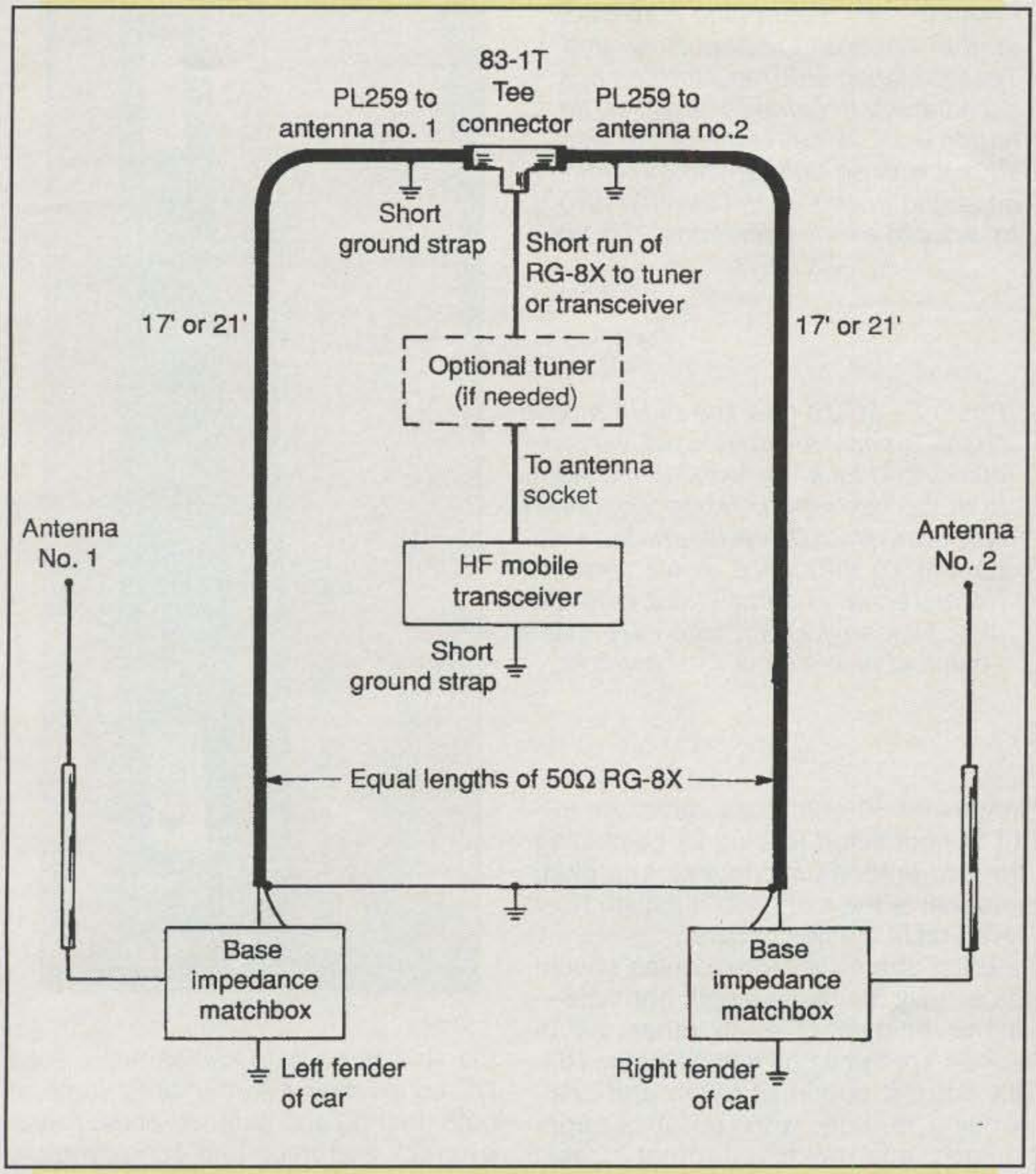

Fig. 1– Electrical outline of the phased mobile antenna system discussed in text.

model 340 mount. Add an MFJ-910 base impedance matchbox to the package, and you are set for some great HF mobiling. Nice! Why include the base matching unit? When a mobile antenna is properly tuned/adjusted, its impedance will be only a few ohms and its SWR will be lowest (but still near 2:1) in your preferred frequency range. Matching that low impedance to your setup's 50 ohm feedline/coax cable can then reduce the SWR to near 1:1. In other words, you first adjust a mobile whip's length to frequency, then you match its base/feedpoint impedance for lowest SWR. Get the idea? There are plenty of fancy multiband mobile antennas both with and without base matching units also available today, but do not sell short the little monoband whip. It is economical and works surprisingly well.

MFJ "Ham-Tennas," incidentally, are available direct from MFJ Enterprises (1-800-647-1800) and/or from ham radio dealers nationwide.

Rompin' Radiators!

A number of readers have urged me to again discuss the concept of phasing two mobile antennas for big-signal mobiling, and the introduction of MFJ's new monoband whips seems like an ideal time to honor those requests. I say that because a high-performance setup built around a pair of them gives 3 dB gain, or doubles your radiated signal strength, but is still less expensive than many presently popular mobile antenna systems. A dual antenna system requires two same-band whips and base matching units, and it can be set up for

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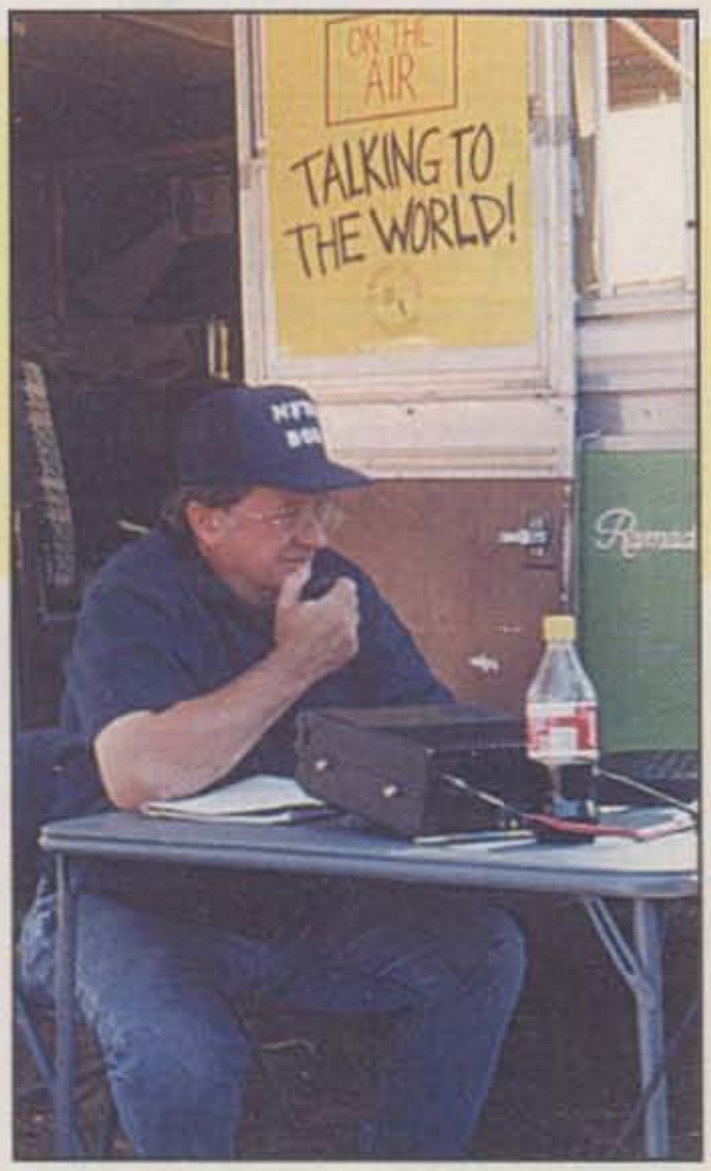

Photo E– NF7E operating from K6G at the Winona Trading Post and Texaco station. Bob reported pile-ups occasionally became so large that he had to work by call districts. He also says it was an unforgettable experience and encourages others to also try special-event operations. (Photo via NE7I)

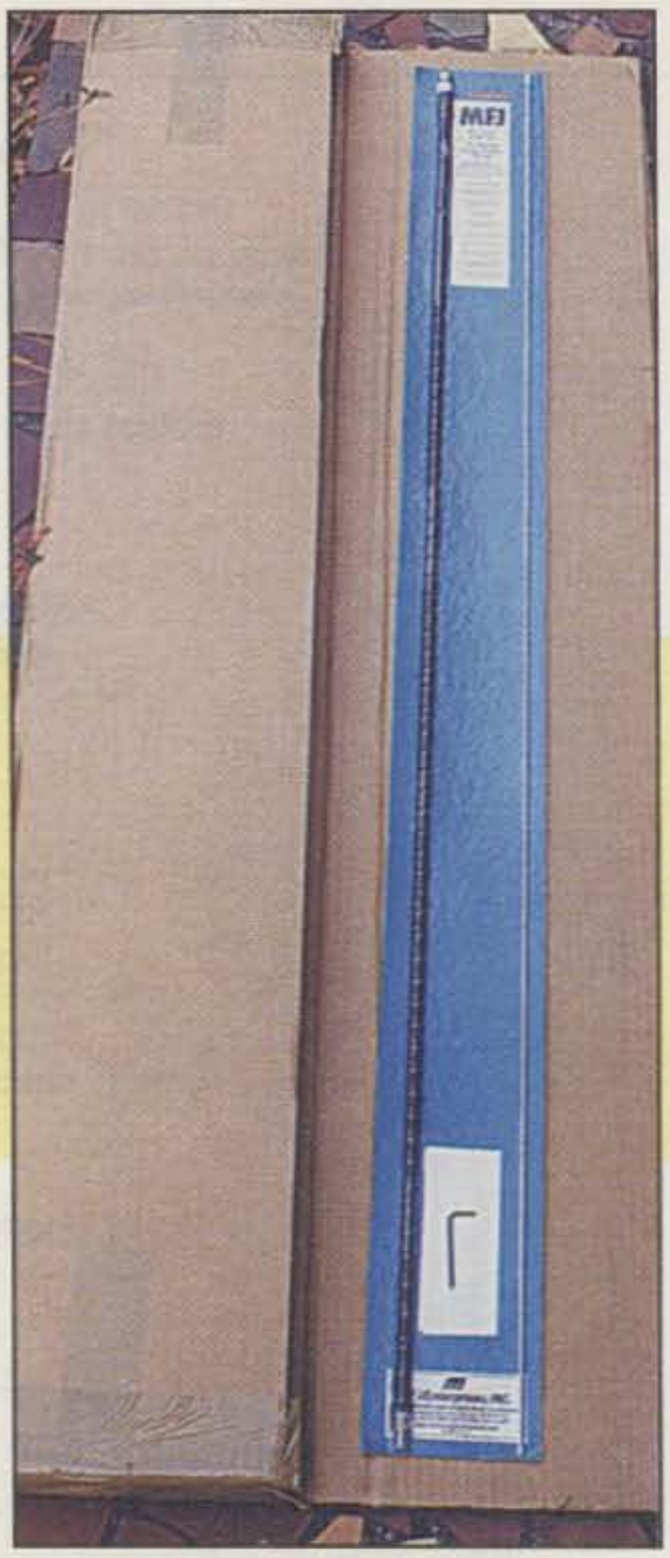

Photo F– MFJ's new line of HF mobile "Ham-Tennas" are low in cost, very well made, and ideal for working the world from the open road. These monoband whips are almost 8 feet tall and are available in 75 through 6 meter versions. "Ham-Tenna" is shown here in its display pack so you can recognize it at a hamfest or in a dealer's showroom.

operating any band above 30 meters (wider whip spacing is preferable for 40 or 80 meters).

Plan your strategy, and you easily could become known as the big mobileer for your band or city. Remember, too, you can always drop back to using only one whip if desired, or add an underdash coax switch to quickly select different (unphased) band whips. Now let's discuss technical details of the setup.

A general outline and almost self-explanatory assembly guide of our Rompin' Radiators is shown in fig. 1, and a ready-for-action picture is included in photo G. A pair of MFJ whips is mounted on the vehicle's rear trunk lip, one on each side, and connected to the interior-mounted transceiver via equal lengths of 50 ohm coax cable. An 83-1T "T connector" is used for combining the two antenna cables into one plug, and that is the story in a nutshell. Now let's add in the fine details.

Each of the two coax cables should be exactly the same length and type—mirror images of each other, so to speak. I prefer using marine-grade RG-8X coax; it is sort of tough and challenging to work with, but it is super rugged and holds up great. Cable lengths are not critical, but I have found 17 or 21 feet works out best and sidesteps entanglements of high SWR produced by resonant lengths such as 16 feet (1/4 wave on 20 meters) or 22 feet (1/2 wave on 15 meters). After installation, double check your work to ensure the shields on both cables make solid DC connection with the car's frame at both their rig and antenna ends. Never overlook that important consideration. Also, be sure to include a ground strap separate from power and antenna cables direct from a seat, body, or firewall bolt to your transceiver's cabinet. This consideration gives the setup a single, solid ground to maximize radiation and minimize RF feedback that can play havoc with on-board computers.

Installation complete? Okay, tune up the antennas as follows. First, install only one antenna, connect its cable to your antenna analyzer or transceiver, and set its stinger for lowest SWR. As previously discussed, that SWR should be minimum (but still near 2:1) in your preferred frequency range. Then use a base matching unit to lower the SWR near 1:1. Next, remove "antenna number 1" from "mount number 1," install "antenna 2" in "mount 2," connect only its coax cable to your antenna analyzer or transceiver, and set its frequency/SWR accordingly. Next, install and connect both antennas. Expect the SWR to change slightly. Hopefully you can reset it with only a minor readjustment to each antenna. Otherwise, add-

Station	QTH	Associated Club
K6A	Chicago, IL	Six Meter Club of Chicago
K6B	St. Louis, MO	St. Louis Amateur Radio Club
K6C	Joplin, MO	Joplin Amateur Radio Club
K6D	Oklahoma City, OK	Choctaw ARC & Oklahoma City Autopatch Assn.
K6E	Amarillo, TX	Panhandle Amateur Radio Club
K6F	Gallup, NM	Albuquerque DX Assn.
K6G	Winona, AZ	Northern Arizona DX Assn.
K6H	Flagstaff, AZ	Northern Arizona DX Assn.
K6I	Kingman, AZ	Hualapai Amateur Radio Club
K6J	Barstow, CA	Barstow Amateur Radio Club
K6K	San Bernardino, CA	Citrus Belt Amateur Radio Club
K6L	Los Angeles, CA	Pocket Autopatch Assn.

Table I– Thanks to clubs from Los Angeles to Chicago joining together (and more combined club members than we could possibly list manning stations K6A through K6L), "Route 66 On The Air" was one of the hottest events of 2000.

ing a small antenna tuner such as the MFJ-945E (mobile tuner with cross-needle SWR meter) between the antenna system's 83-1T plug and your transceiver should get everything perking smoothly.

Ideally, phased vertical antennas should be mounted a half wavelength apart, and that arrangement usually produces 4 or 5 dB gain. Here, however, our antennas can only be separated by a car's width. The arrangement still works fine, but gain drops slightly—to around 3 dB. Still, that is equivalent to making a 100 watt rig sound like 200 watts (plus giving a comparable boost in reception), and that "first 3 dB jump" is the increase that makes the most difference in your signal's strength. The 3 dB gain is broadside to the antenna's elements, or in-line with the car's front and rear. A slight null in strength is noticeable to the sides of your car. This is one killer-good antenna system. Try it!

Conclusion

That winds down our travels for this time, gang, but stay tuned for more mobiling 2001 news, views, and notes next month. Meanwhile, bear in mind these days and months are the "good times" we all will remember in later years. Get on the air and enjoy them! Listen carefully on 20 meters SSB on April 1st, too, as I am planning to conduct a second annual special-event operation complete with certificates and souvenirs from Alabama's secret UFO base in little-known area 33. Good mobiling and 73!

Dave, K4TWJ

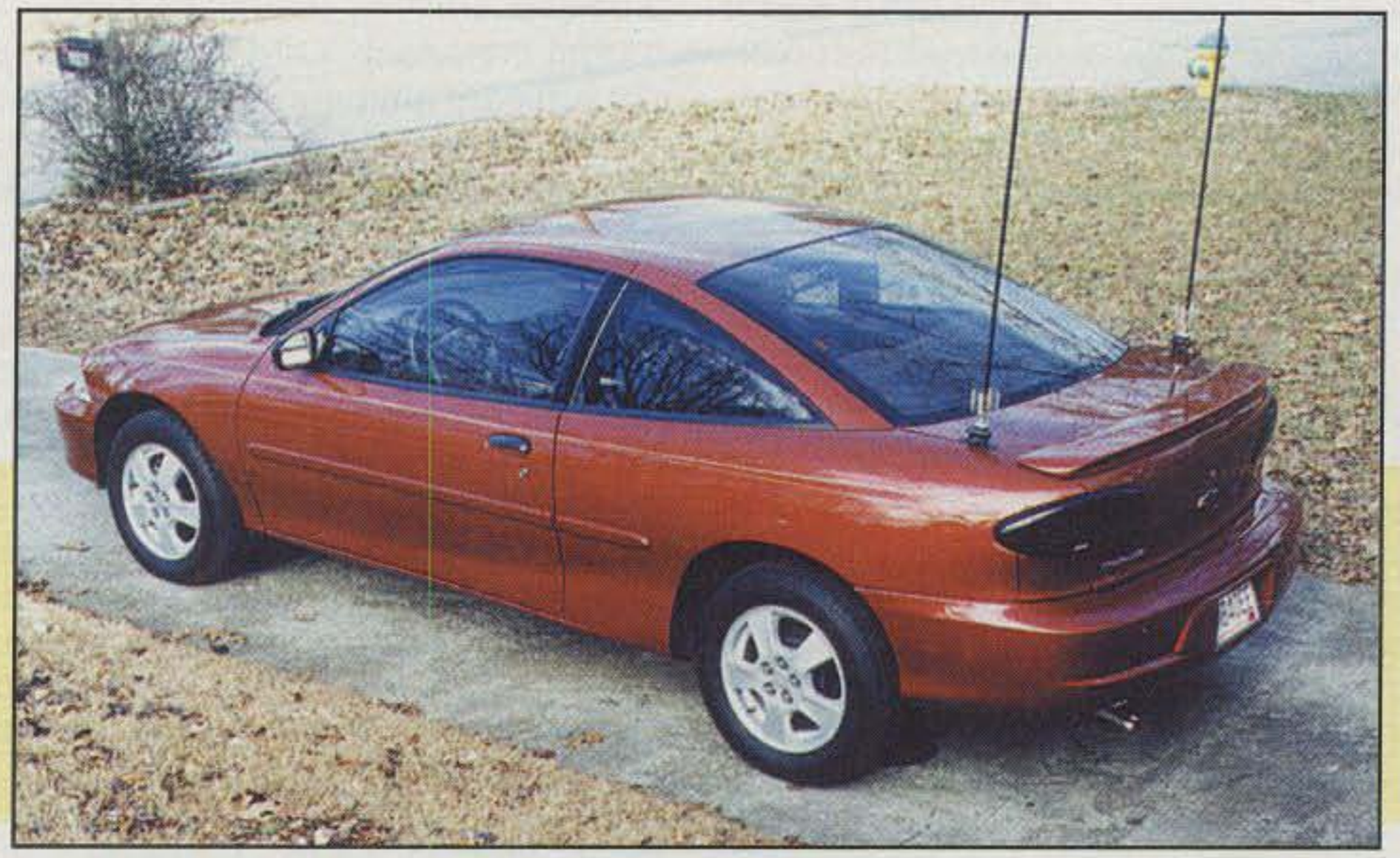

Photo G– Look out, Route 66. We are geared up with phased antennas and mobiling to the max! This mildly customized Cavalier belongs to Sandy, WB4OEE, and pumps out a globe-spanning signal.

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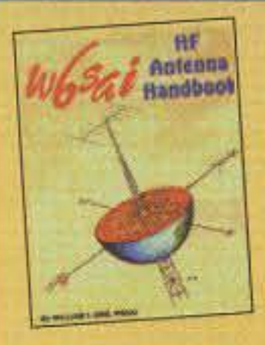

W6SAI Antenna Handbook
by Bill Orr, W6SAI
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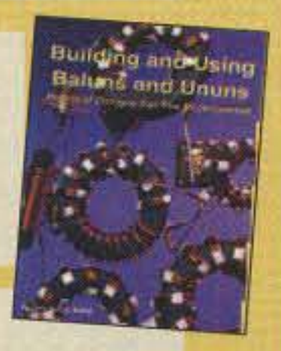

Building & Using Baluns & Ununs
by Jery Sevick, W2FMI
Info and designs on transmission line transformer theory!

The Quad Antenna
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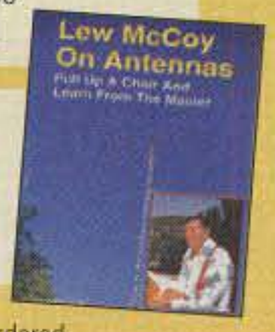

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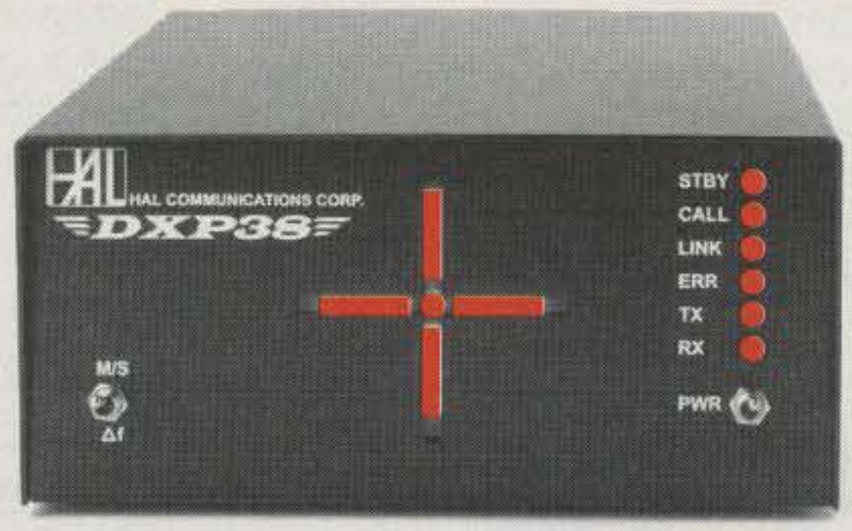

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Digital Wireless

BY STEVE STROH, N8GNJ

Packet Radio and Beyond

N8GNJ Elected to TAPR Board of Directors

As I've reported previously in this column, several vacancies have occurred on the Tucson Amateur Packet Radio (TAPR) Board of Directors. I was asked to fill the unexpired term of former TAPR president Greg Jones, WD5IVD, and after some consideration I accepted. I did so because I believe that TAPR, more than any other organization in amateur radio, has the ability to change amateur radio to meet the challenges it will face in the coming decades. Digital techniques have swept through all other sectors of wireless communications, but the last big change in amateur radio technology was the introduction of packet radio in the early 1980s. I think that amateur radio *must* change and evolve, and do so relatively rapidly. However, it can't, because amateur radio, as a whole, can't agree on what changes should be made.

More than any other organization in amateur radio, TAPR has embraced the changes that have been brought about by the internet. TAPR has had an internet presence for a very long time, and a web presence since the web was popularized in the mid-'90s. TAPR is one of the few organizations in ham radio that recognizes the synergies between the hobby and the internet, not just in "presentation," but also in internetworking.

TAPR brings some considerable strengths to the discussion of what amateur radio should become and how it can do so. For one, TAPR's Board of Directors consists of "citizen soldiers." All maintain full-time jobs in various technology industries and serving on the TAPR Board is a considerable extra commitment. All are involved in amateur radio digital communications.

Pioneering History

TAPR has done considerable pioneering work in amateur radio digital communications. TAPR's stand on spread-spectrum communications in amateur radio while the FCC was considering revising spread-spectrum rules was courageous and, in my opinion, the most forward-looking of all the organizations submitting comments.

Most important, TAPR builds things that ordinary amateurs can make work and do interesting things. TAPR's mantra (not very visible yet, but we're working on it) is "Enabling Technologies." TAPR sees its role as creating technologies and products that enable other changes to take place. An example of this is TAPR is playing a leading role in the use of microcontroller-based devices in amateur radio digital communications. This is very significant because while hardware has increasingly been moving beyond the capabilities of average amateurs to experiment with, software (such as that used to program microcontrollers) has increasingly been moving to *within* those capabilities. TAPR's kits, mailing lists, and no-cost web pages encourage experimentation and the development of new kinds of communications.

An SDR in Your Future?

TAPR plans to begin a serious push to put a software-defined radio (SDR) kit in the hands of many amateurs. The kit will be a small box with three "ports"—power, antenna, and data. All of the control functions, audio in, and audio out come from an attached personal computer. To a much greater degree than has ever been possible previously, the functionality of the radio is entirely determined by software. New modulation techniques, new operational techniques, etc., can be tried easily.

I think it's this last aspect of TAPR that is most relevant to the discussion of how amateur radio can and should evolve in the coming decades. *What* amateur radio *is*, to a large extent, is determined by the equipment that is available to amateur radio operators. If leading-edge equipment isn't available, it doesn't do any good whatsoever to develop new techniques, procedures, and so on. Commercial manufacturers, especially the large companies that currently dominate the amateur radio market, aren't equipped to lead such revolutions. They need volume sales and standardized technology to make a profit. Few small companies can afford to try to pioneer new technology in amateur radio.

That leaves TAPR as something of a hybrid, able to afford risk, and also able to get hardware into the hands of ordinary amateur radio operators. Not that it's easy for TAPR to accomplish these goals. Quite the contrary: TAPR has had its share of failures, projects that had high expectations but ultimately didn't come to fruition. However, TAPR did try, and out of such experiences we learn more for the next time. Too, TAPR is organized such that such failures don't kill the organization.

Inevitably, being a member of the TAPR Board of Directors changes my writing in this column somewhat. For one, I'm no longer able to criticize TAPR publicly because I'll be working on the inside of the organization (although careful readers likely will note that I've been far more of a fan of TAPR than a critic). Plus, I'm forced to keep something of a "firewall" between my writing here and what I do for TAPR. Overall, I think the two roles are complementary, and expect that readers of this column will be better served by my election to the TAPR Board of Directors.

Amateur Radio and Wireless Technical Education

I'm a graduate of DeVry Institute of Technology (1978–80, Columbus, Ohio, then called Ohio Institute of Technology). I recently attended the groundbreaking ceremony for DeVry's newest (21st in North America) campus in the Seattle area. I took a quick glance at the course catalog and there wasn't much in the way of wireless listed—one quarter, lumped in with several other subjects. That wasn't surprising to me. In a recent glance at a course catalog for ITT Technical Institutes (as far as I can tell, DeVry's nearest competitor in electronics-focused, for-profit higher education) I did not see any coverage of wireless technology at all.

If *these* institutions, focused as they are on the practical, functional aspects

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of electronics technology, aren't emphasizing wireless, from where are those skills going to come?

It seems to me that amateur radio could have a role to play in institutions such as DeVry Institute of Technology and ITT Technical Institutes which are focused on electronics. Keep in mind that most of what I'll write here is speculation, as I've not held discussions about this with any institutions.

• Study material for amateur radio licensing is easily (and relatively inexpensively [compared to textbooks]) available; no new material would have to be developed.

• A major factor in pursuing an amateur radio license in the past was the code test. Now it is possible to obtain an amateur radio license without the requirement to learn code, and even an Extra Class license requires only a 5 word-per-minute code test.

• Volunteer Examiners can come to each school on a schedule convenient to the students (important because most students of such schools work at least part-time).

• The institution benefits by exposing students to wireless technology in a way that they likely will expand their knowledge on their own. (Many will choose to become and remain active hams.)

• Amateur radio technology is an inexpensive way to introduce students to wireless technology. For example, construction of ham radio kits could be used as lab exercises. For example, TAPR's upcoming Software Defined Radio kit would expose students to digital signal processing, software-hardware integration, and perhaps wireless networking. (The kit will need to connect to a local node to be considered complete.)

• APRS and voice repeaters, possibly located at each school, coupled with low-cost "user access devices" such as portable radios, inexpensive GPS (Global Positioning System) receivers, and simple/cheap interfaces, may well appeal to students.

One other factor: There are relatively few such institutions, so such an effort, at least in its early stages, likely would be reasonably manageable.

More on 802.11

I've touched on 802.11 (a family of standards for wireless Local Area Networks) in several previous columns. Basically, 802.11 is going to become as ubiquitous as Ethernet. I think that amateur

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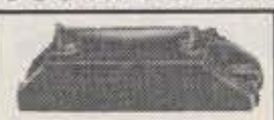

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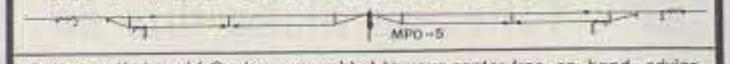

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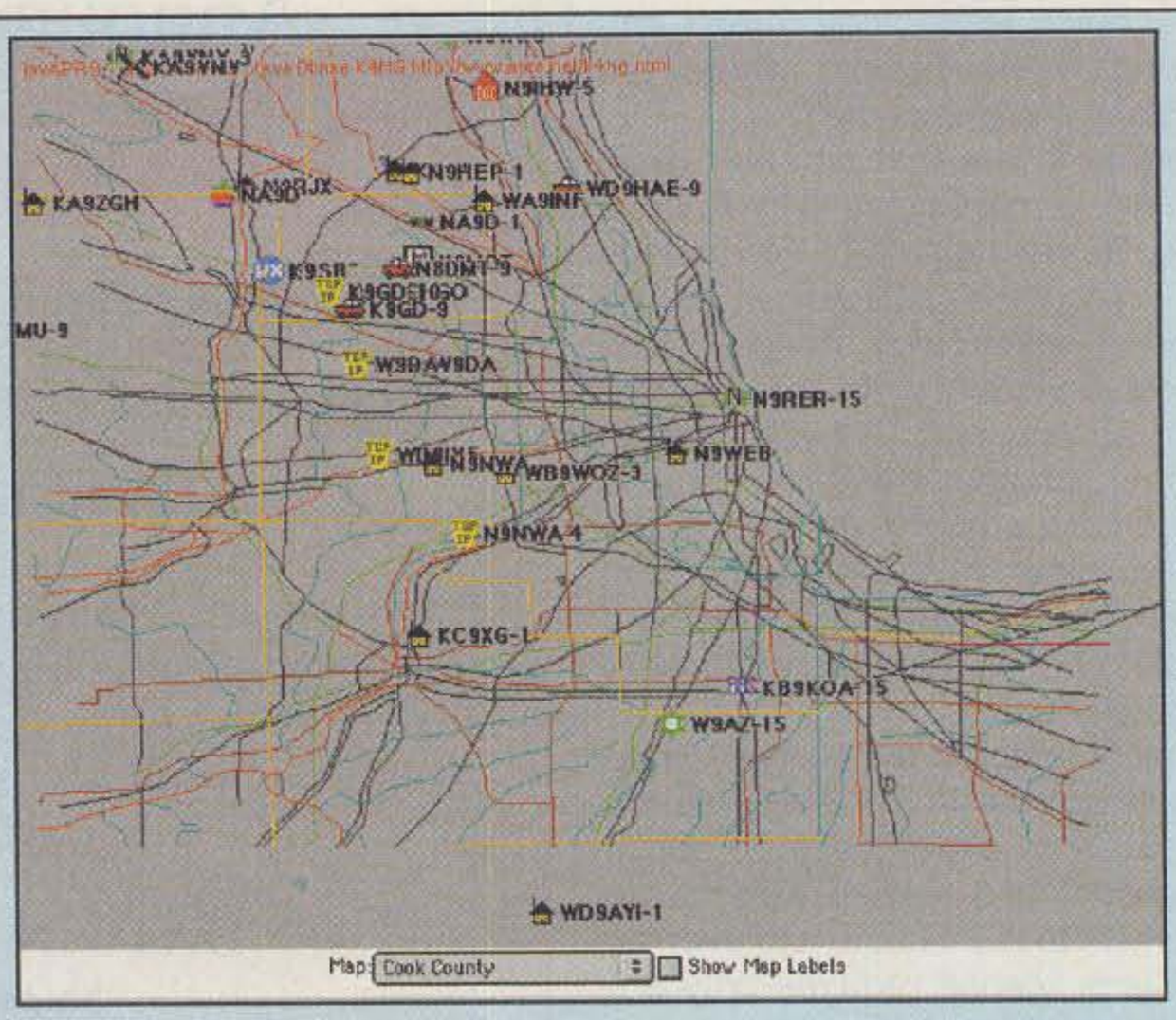

Live APRS maps are available on the internet from several websites, including K4HG's site at <http://www.aprs.net>. You can change the map to show you any regional view in the United States and zoom in or out as you please.

Web Pages of The Month

This month's web pages focus on APRS, the Automatic Position Reporting System and are an excellent example of blending amateur radio and the internet.

<http://www.aprs.net> – The web page of Steve Dimse, K4HG (a fellow TAPR Board member). Displays live APRS data running on a Java applet in your web browser.

<http://www.aprs.org> – The web page for APRS by Bob Bruninga, WB4APR (inventor of APRS). Lots of links, very informative.

<http://www.findu.com> – A web-based interface to the APRS network. APRS data, including weather reports, is stored in a database for easy retrieval. Want to know where a ham friend is wandering? Findu.com may know.

radio should be co-opting 802.11 technology for "its" purposes, and begin doing some of the things that hams do, using 802.11 equipment.

Another Wireless Local Area Network standard that well may have more direct applicability to amateur radio is HomeRF. Where 802.11b (the most common version of 802.11 now in use and being sold) uses direct-sequence (DS) spread spectrum, HomeRF uses frequency- hopping (FH) spread spectrum. (Both operate in the 2.4 GHz license-exempt band.) HomeRF feels that in the home environment "interference" will be common, and FH tends to overcome interference better than DS. It's conceivable that HomeRF technology could be adapted for use in amateur radio—for example, brought down from 2.4 GHz to UHF or 1.2 GHz (*or even used in the amateur portions of the 2.4 GHz band—ed.*).

I'm very interested in talking to readers who have hands-on familiarity with 802.11 and HomeRF technology. I'm particularly interested in talking to those who have some knowledge of "802.11AX," which is rumored to be an adaptation of 802.11 technology for use in amateur radio.

Major Events On My Calendar

Dayton Hamvention (Dayton, Ohio), May 18–20, 2001. Attending Dayton annually has become a habit I'm loath to break, even though it now means a plane trip from Seattle rather than a reasonable drive down from Cleveland as it used to be years ago. This will be my first Dayton as a *CQ* columnist, and I hope to see and report on new and exciting digital products being shown there, making good use of my digital camera. I plan to be around the TAPR and *CQ* booths for at least part of my time there. A major event, as always, is the TAPR PacketBash dinner, and, of course, there are the TAPR and other digital forums.

As always, comments and questions on these and other topics in this column are welcomed.

73, Steve, N8GNJ

Washington Readout

Regulatory News In The World Of Amateur Radio

BY FREDERICK O. MAIA, W5YI

The International Aspect of Amateur Radio

WRC-2003 to Consider Amateur Radio Regulations

In the United States, the Federal Communications Commission (FCC) allocates frequency bands and regulates the various radio and wireline services, including the Amateur Radio Service. The basic document controlling U.S. telecommunications is the Communications Act of 1934, which also created this independent governmental agency. The FCC's work must be done within a framework of international telecommunications agreements of which the United States is a part. The world-wide organization overseeing global telecommunications is the International Telecommunication Union.

A Bit of History

Electric signaling arrived in 1835 when Samuel Morse employed a chemical battery and a lever to send currents through a wire circuit. The original Morse machine printed code on tape. The word "telegraph" was coined to mean a device that could print patterns at a distance. It was derived from the Greek *tele* (far) and *graphein* (to write). The discovery of the "ground return" circuit meant that only one wire would be needed.

About 20 years before the ITU was founded, Samuel Morse ushered in the communications age by sending his first public "What hath God wrought?" message on May 24, 1844 over an experimental telegraph line between Washington, DC and Baltimore. He developed a key and sounder for this demonstration, since he discovered that the code could better be received by ear, thereby eliminating the printer. Telegraph became a popular means of communication among the general public.

Within ten years the tentacles of the electric telegraph had spread to England and Europe. In 1851 countries in Europe adopted a new version of the "American" Morse code which they called the "continental" or "international" Morse. The new code eliminated the characters using close-spaced dots and replaced them with "dahs," which required longer key closure. Nations everywhere began to establish telegraphic networks within their boundaries.

The Need for International Regulation

Wireline telegraphy, however, did not cross national borders, and technical and operating standards varied widely from country to country. Some countries even had their own telegraph code to safeguard the secrecy of military and government messages. It was not unusual for messages to be transcribed at national borders and then physically handed over to telegraph operators for retransmission over a neighboring telegraph network. By 1864, though, there were several regional agreements in force which provided for the interconnection of their networks.

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A year later the ITU was founded as the International Telegraph Union by some 20 European states in order to expedite the delivery of telegraph messages between countries. It was the world's first international coordinating body. The second (formed on September 15, 1874) was the Universal Postal Union. Both faced similar obstacles, since the mail and telegraph lines both had to cross national borders.

In 1932 the name International Telecommunication Union was adopted to reflect the body's added responsibilities. The ITU became a United Nations specialized organization in 1947, and its headquarters was moved from Bern to Geneva, Switzerland.

The ITU is basically an organization of governments from countries around the world. Each government cooperates with the private sector to develop telecommunication technology. By agreement among the participating members, the ITU adopts broad international regulations concerning the use of the radio-frequency spectrum. These regulations tend to be very general in scope, thus providing a certain amount of national flexibility and application. These accords have the force of international treaty once ratified at the national level. Today the International Telecommunication Union is the most powerful organization in this, the Information Age, and just about every country in the world sends a delegation to its conferences.

Since radio does not respect national borders, the various countries of the world must agree on guidelines and frequency allocations for the various radio services. Allocation of radio frequencies consists of dividing the spectrum into a number of segments, or frequency bands, for the various radio services. These bands are influenced by the propagation of radio waves at different frequencies. For example, frequencies on which signals travel great distances are allocated for long-distance communications such as international broadcasting; spectrum that can pierce the ionosphere and be returned by transponders is reserved for satellite communications; and so forth.

The ITU band plan divides the world into three geographical regions. Region 1 encompasses Europe, the Middle East, and Africa; Region 3 Asia and Oceania (the South Pacific); and Region 2 North, Central, and South America. For the most part, FCC allocations conform to those in Region 2.

Amateur radio began with a few experimenters in the early 1900s. It has since grown to more than 2.5 million licensed ham operators worldwide. The Amateur Service is very fortunate to have allocations in all bands, each with different propagation characteristics.

World Radio Conferences

The 1865 Paris convention that established the ITU resulted in an international convention and a set of telegraph regulations. Since those early days, communications technology has developed and along with it, the ITU. Following the invention of the telephone in 1876, the ITU drew up interna-

tional legislation governing telephony. The development of wireless telegraphy—the first radiocommunication—led to the first International Radiotelegraph Convention in 1906. It was at this conference that the first regulations governing wireless telegraphy came into being. They now are known as the Radio Regulations. The first ITU frequency allocations were made in 1927.

These meetings, originally called World Administrative Radio Conferences (WARCs) have been convened periodically over the past century. WARCS used to be held every ten or twenty years and covered all radio services. In recent years they have been held more often (about every two or three years) with more limited agendas. WARCs are now known as World Radio Conferences, or WRCs.

International Amateur Service Regulations

The ITU defines the amateur service as "A radiocommunication service for the purpose of self-training, intercommunication and technical investigations carried out by amateurs, that is, by duly authorized persons interested in radio technique solely with a personal aim and without pecuniary interest."

The current international Radio Regulations that deal specifically with the Amateur and Amateur-Satellite Services are contained in Article 32 of the 1994 and earlier editions of the Radio Regulations. Article 32 was renumbered Article S25 at WRC-95.

WARC-92 agreed that the general scope of future conferences should be established four years in advance. Accordingly, before WRC-95 adjourned, Resolution 720, "A Preliminary Agenda for the 1999 World Radiocommunication Conference," was adopted. Item 2.2 of this agenda was "Consideration of Article S25 concerning the Amateur Service and the Amateur-Satellite Service." However, due to a very full agenda, consideration of S25 was carried over to WRC-03.

Amateur radio regulations as outlined in Article S25 are now on the agenda to be discussed at the 2003 World Radio Conference. Last summer the ITU (at WRC-2000 in Istanbul, Turkey) scheduled the 2003 session (WRC-03) for a period of four weeks from 9 June to 4 July 2003. In its agenda item is the following five-word item: "Item 1.7.1: possible revision of Article S25." As of this writing the exact location for WRC-03 has not yet been selected, but we heard that it would be held in Venezuela, South America.

Actually, the ITU's entire international amateur radio regulations are not very long. They spell out the purpose of the Amateur Service, the type of communications allowed, the need to identify your station, brief technical requirements and who may be a ham radio operator.

At a 1947 meeting in Atlantic City the ITU agreed that Morse proficiency should only be required when amateur operation took place on frequencies below 1000 MHz (1 GHz). At WARC-59 the 1959 World Administrative Radio Conference dropped this level to 144 MHz. A further reduction was made at WARC-79 to its present 30 MHz level. WARC-79 also resulted in amateur radio gaining the 30, 17, and 12 meter bands. It is interesting to note that the Morse code requirement has been relaxed at every international conference capable of doing so.

Articles S25.5 and S25.6 specify qualifications and the fact that operators must be Morse proficient in order to operate on the HF ham bands. They currently read:

S25.5 § 3.—(1) Any person seeking a license to operate the apparatus of an amateur station shall prove that he is able to send correctly by hand and to receive correctly by ear, texts in Morse code signals. The administrations concerned may, however, waive this requirement in the case of stations making use exclusively of frequencies above 30 MHz.

S25.6 — (2) Administrations shall take such measures as they judge necessary to verify the operational and technical qualifications of any person wishing to operate the apparatus of an amateur station.

Note that the Radio Regulations do not specify any particular Morse code proficiency level. This means administrations are free to adopt any speed. Last year the United States was among the first to reduce its highest code speed to 5 words-per-minute. One by one nations around the world have been following our lead.

On November 9, 1988 a decision was made by another worldwide organization, the London-based International Maritime Organization, that would eventually lead to ending Morse code communications on the high seas. The advent of satellite and automatic digital technology had now made Morse code totally obsolete in that environment. The IMO replaced Morse communications with a new long-range Global Maritime Distress and Safety System (GMDSS).

In 1995 the U.S. Coast Guard discontinued monitoring the 500 kHz distress frequency in 1995. In essence, the U.S. Coast Guard has said that manual telegraphy is no longer important to the safety of life on ocean-going vessels. It is widely anticipated that at WRC-03 the ITU nations will also totally abolish the need for amateur operators to be Morse code proficient.

The IARU

The Amateur Service is more or less represented at ITU conferences by the International Amateur Radio Union. The IARU got its start more than 75 years ago when American Radio Relay League founder Hiram Percy Maxim felt that since ham radio is international in scope, there should be a global organization to promote and coordinate its needs. The organization was created in 1925 when representatives from 23 countries, mostly in Europe, met in Paris to adopt a constitution.

The structure of the IARU is very similar to that of the ITU in that the various national member societies belong to regional organizations that geographically match the ITU's three regions. One of these IARU regions conducts a conference each year, with each country having one vote. The IARU is managed by an Administrative Council and an International Secretariat, the American Radio Relay League.

The Administrative Council consists of a president (which is provided by the ARRL), a vice-president, a secretary, and two members from each of the three regional organizations. The IARU has no regulatory authority and does not vote at ITU meetings. It merely has "observer status" at the ITU.

In 1994 the IARU CW Ad Hoc Committee concluded that while Morse code remains essential for radio amateurs using the bands below 30 MHz, "Any changes to Article S25 that may be desirable in the next decade or two must be considered now. On that basis, the Committee has concluded that S25.5 should be removed as a treaty obligation of administrations." The IARU Region 1 and 3 Conferences held in 1999 and 2000 also agreed.

The January 2001 ARRL Board Meeting

At the ARRL's 2001 Annual Board meeting the League voted (9 to 6) not to further support S.25.5 and to endorse its total

elimination at the international level. Thus, the League will vote to end the international code proficiency requirement at the Region 2 Conference to be held in Guatemala this coming October. The League said that each country should be allowed to determine for itself whether it wants to have a Morse code requirement. While saying that it no longer supported S25.5 at the international level, the board continues to support Morse testing in the U.S.

The following resolution concerning Morse code communications was adopted by the board.

•*WHEREAS,* Morse code, named after Samuel Finley Breese Morse, is an invention that has been essential to telecommunications for over 150 years; and

•*WHEREAS,* the international Morse code has been an essential mode to Amateur Radio from its beginning to this day; and

•*WHEREAS,* Radio Amateurs formed a pool of skilled Morse operators vital in the 20th Century for national defense, disaster, maritime-mobile and aeronautical-mobile communications; and

•*WHEREAS,* since the 1950s there has been a great influx of other technologies that have gradually reduced the need for trained Morse operators outside the Amateur services; and

•*WHEREAS,* the aeronautical-mobile and maritime-mobile applications of Morse have been or are being terminated throughout the world; and

•*WHEREAS,* there is an agenda item for the 2003 World Radiocommunication Conference to consider Article S25; and

•*WHEREAS,* it is highly likely that administrations will delete the Morse code requirement in Article S25 at WRC-2003; and

•*WHEREAS,* the international Amateur community has followed the United States lead in reducing the code speed requirement for licensing to operate on bands below 30 MHz to 5 words per minute and there is a trend toward elimination of this requirement;

•*NOW THEREFORE BE IT RESOLVED,* that the ARRL Board of Directors recognizes and accepts that suppression of the Morse code requirement in Article S25 is likely to occur at WRC-2003; and be it

•*FURTHER RESOLVED,* that deletion of the requirement from Article S25 should not automatically or immediately mean a similar removal of the Morse code from Part 97 of the FCC rules; and be it

•*FURTHER RESOLVED,* that each administration should determine if Morse code is retained as a testing element; and be it

•*FURTHER RESOLVED,* it is the opinion of this board at this time that Morse code should be retained as a testing element in the U.S.; and be it

•*FURTHER RESOLVED,* that the Morse code is deserving of continued support as an important operating mode including providing for the protection and maintenance of sufficient spectrum in band planning; and be it

•*FURTHER RESOLVED,* that staff develop a program designed to promote the use of Morse code; and be it

•*FURTHER RESOLVED,* that this resolution supersedes all previous statements of policy related to suppression of the Morse code requirement in Article S25.

FCC Begins WRC-2003 Preparations

In preparation for the next World Radiocommunication Conference in 2003, the FCC has now formed WRC-03 Advisory Committee. It met for the first time on January 30 at FCC headquarters in Washington. A WRC-03 web site has been set up at <http://www.fcc.gov/wrc-03> along with a mailbox for the committee, <wrc03@fcc.gov>.

The Advisory Committee provides an opportunity for interests outside the federal government to develop and debate U.S. draft proposals for possible adoption by the FCC, the National Telecommunications and Information Administration and the U.S. Department of State.

Most of the issues of concern to amateurs have been assigned to the WRC-03 Advisory Committee's Informal Working Group 6.

WRC-03 will also consider realignment of amateur and broadcasting bands around 7 MHz on a worldwide basis. The long-standing problem was identified in a WARC-92 recommendation that called for realignment at some future conference. The IARU is committed to supporting a "'harmonized"' worldwide 300 kHz allocation in the vicinity of 7 MHz.

Now that the ARRL has acknowledged and accepted the likelihood that the ITU will eliminate S25.5 in 2003, and has voted not to fight it, it can focus its energies on the 40 meter question. The main problem here (if you're not active on 40) is that 7.1–7.3 MHz is allocated to amateurs in ITU Region 2, but to international broadcasters in Regions 1 and 3. Interference is inevitable and increasing. The ARRL is hoping to reach an international consensus on a worldwide amateur allocation from 6.9 to 7.2 MHz, with all broadcasters moved above 7.2. Other interests have other plans, though, so it won't be easy. It's also good that the ARRL can focus its full attention on working out an equitable solution to the 40 meter allocation problem.

73, Fred, W5YI

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What's New

BY KARL T. THURBER, JR., W8FX

A New Column for A New Century

A One-Year Anniversary

It was just a year ago that the "under construction" wraps came off our retitled column. With our name change, we dramatically expanded the column's scope. As of last April we no longer focused strictly on antennas, antenna accessories, software, books, and computers. Instead, we would tackle an expanding array of products as we examined "what's new" in amateur radio in the new century. That's what we have done, so let's get started.

Portable and Mobile Goodies

Nil-Jon Super Mobile Antenna. As we mentioned in last February's "Digital Dipole" column, Nil-Jon Antennas offers a broad line of high-performance, rugged, compact antennas for amateur radio, business communications, VHF/ UHF scanning, FM and TV reception, and more. According to the firm, only top-quality materials are used in the antennas.

Paul Bransztet, K8QT, let us know that Nil-Jon Antennas has introduced what it considers a "breakthrough" antenna, the new Super Mobile Antenna, also known as the "Super-M." Their first mobile antenna is a low-profile, 18 inch, high-performance product. The compact, dual-polarized design has no losses from coils, windings, or traps because they are not used.

The $69.95 Super Mobile consists of three tipped elements angled up from the specially finished base cone that fits "LM" style mounts. Adapters are available for "NMO" mounts.

The new antenna is suitable for monoband, dual-band, or multiband operation, and even for non-amateur- band mobile operation within its several broad operating ranges. It can work on any frequency in three radio bands: 140–170 MHz and/or 200–225 MHz and/or 400–480 MHz. SWR matches are said to be 2:1 or better, and no tuning is required.

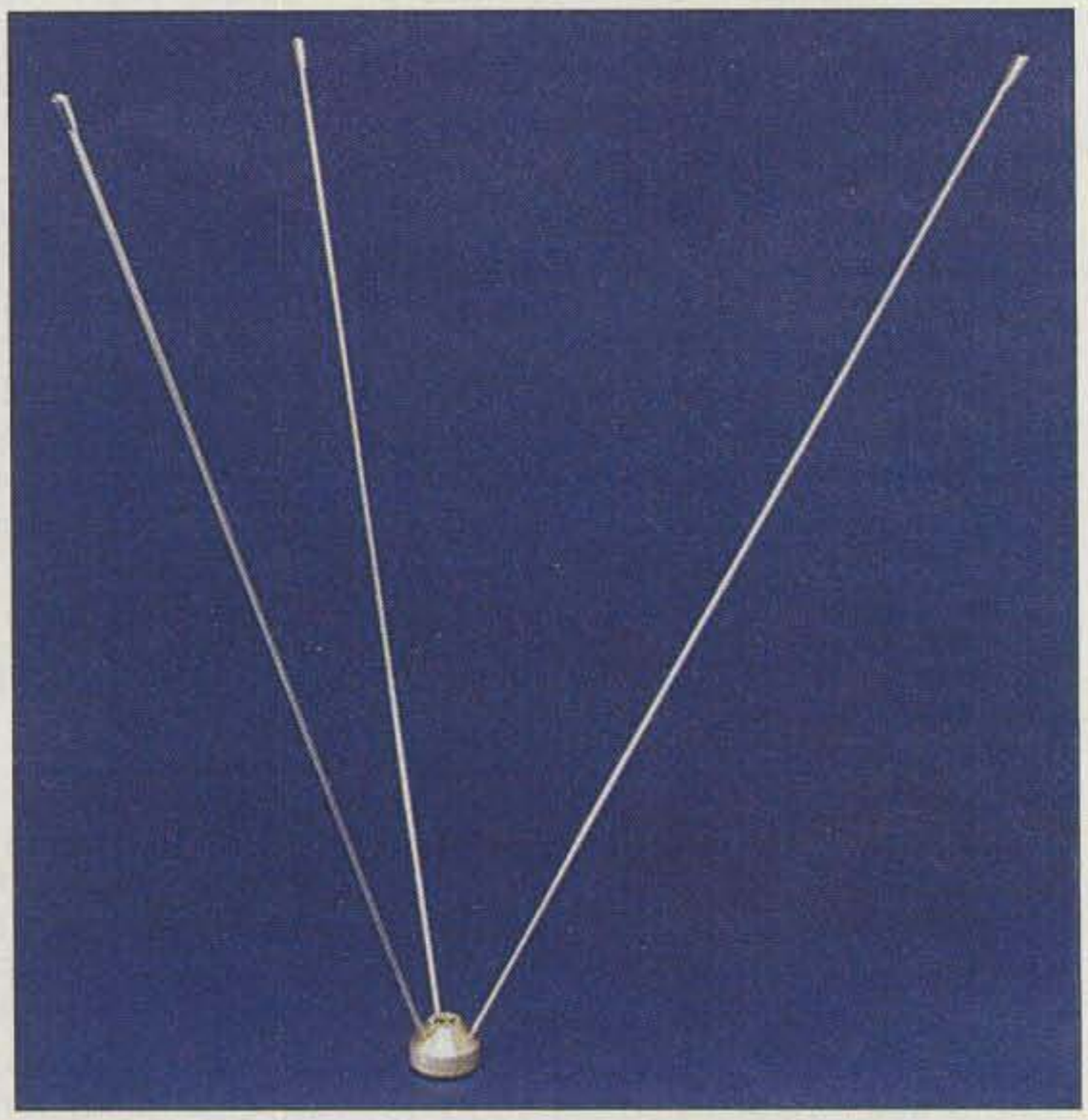
Paul indicates the antenna's greatest benefit is its dual polarization, which affords mobiles the increased ability to stay in contact with repeaters over variable terrain. Rock-solid performance and anti-flutter characteristics are definite pluses.

Contact Nil-Jon Antennas, Inc., P.O. Box 764, Amherst, OH 44001 (telephone 440-989-2295; e-mail: <paul@ nil-jonantennas.com>; web: <www.nil-jonantennas.net>).

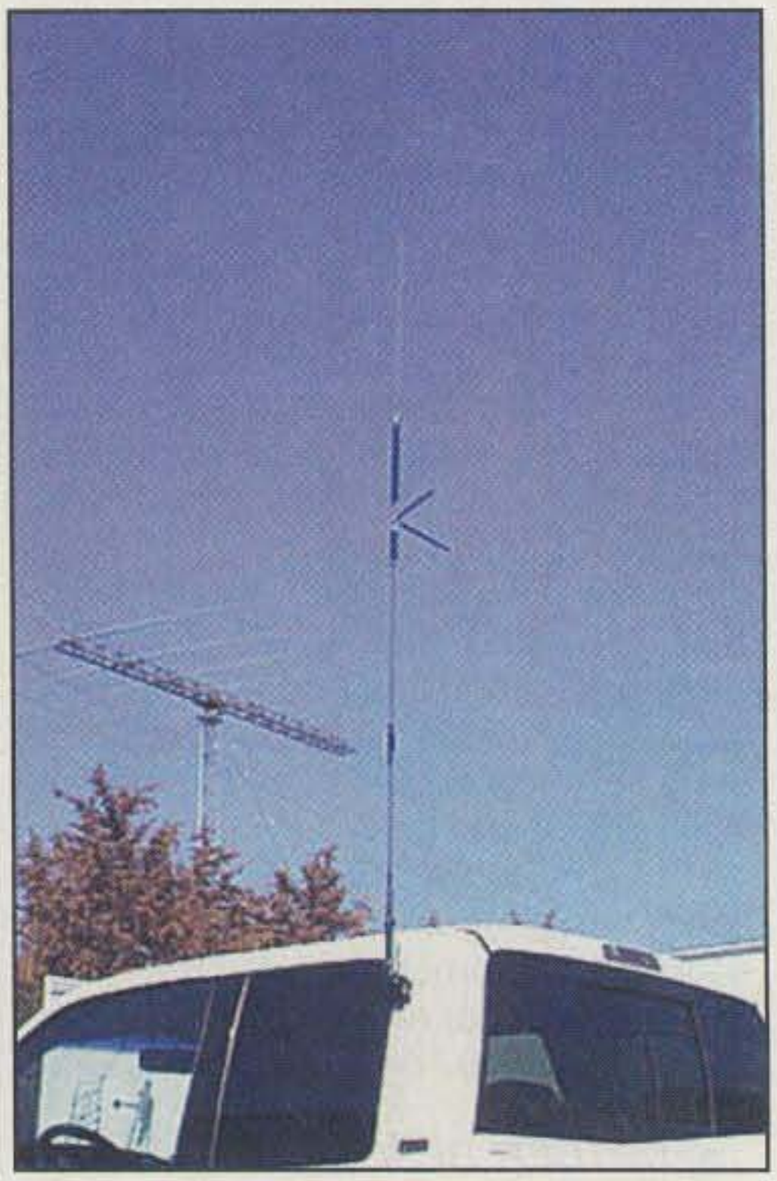
NCG/COMET UHV-6 40 meter through 70 cm Mobile Antenna. Japan-based COMET Antennas and its American distributor, NCG Company, have been doing business with radio amateurs for years. The extensive product line includes monoband, dual-band, and triband antennas along with band combiners (splitters, duplexers, and triplexers) for all combinations of frequency splits. Other products offered by NCG include power/SWR meters and NCG's own Power Pocket, a special battery pack and charger combination.

Recently, NCG Company introduced the multiband UHV-6 40 meter through 70 cm mobile antenna to complement the many new multiband HF/ VHF/UHF radios that recently have been introduced. The antenna operates over the 40, 15, 10, 6, and 2 meter, as well as 70 cm, bands.

*289 Poplar Drive, Millbrook, AL 35054-1674
e-mail: <w8fx@cq-amateur-radio.com>



The new Nil-Jon Super Mobile Antenna is suitable for monoband, dualband, or multiband operation. It can work on any frequency in three radio bands: 140–170 MHz and/or 200–225 MHz, and/or 400–480 MHz. SWR matches are said to be 2:1 or better, with no tuning. (Photo courtesy Nil-Jon Antennas, Inc.)



Recently, NCG Company introduced the multiband UHV-6 40 meter through 70 cm mobile antenna to complement the many new multiband HF/VHF/UHF radios. The new antenna operates over the 40, 15, 10, 6, and 2 meter, as well as the 70 cm, bands. At $159.95, the UHV-6 is a relatively inexpensive six-band antenna. (Photo courtesy NCG Company)

At a $159.95 manufacturer's suggested retail price, the UHV-6 is a relatively inexpensive six-band antenna. The main antenna mast is tuned for constant operation on 6 and 2 meters, plus 70 cm. Three HF coils—for 40, 15, and 10 meters—are included with the antenna; the user chooses to add one, two, or all three coils to the top of the antenna for six-band operation. Optional coils cover 20 and 17 meters. The HF coils tune independently, and you can add up to four coils to the main mast for four, five, six, or even seven-band mobile operation. The antenna is easily mounted using a standard trunk or hatch/door mount; there are no holes to drill or special brackets needed. The base of the mast has a convenient foldover hinge for entering garages or other low-clearance structures. COMET makes several duplexers and mounts for use with the UHV-6.

Contact NCG Company, 1275 North Grove St., Anaheim, CA 92806-2114 (1-800-962-2611; e-mail: <micks@ comet antenna.com>. web: <http:// www.cometantenna.com>).

Software and Computers

Ham Radio ClipArt CD and Associated Website. Where is all the ham radio clip art when you really need it? Much of it is to be found on the Ham Radio ClipArt® by TK5NN CD-ROM. The CD's current incarnation, offered by Patrick Bittiger, TK5NN, is usable with both IBM-PC and Macintosh computers. It covers a wide range of themes with its 1350+ images, which are provided in high-quality bitmap (TIFF) and vectorial (EPS) image formats.

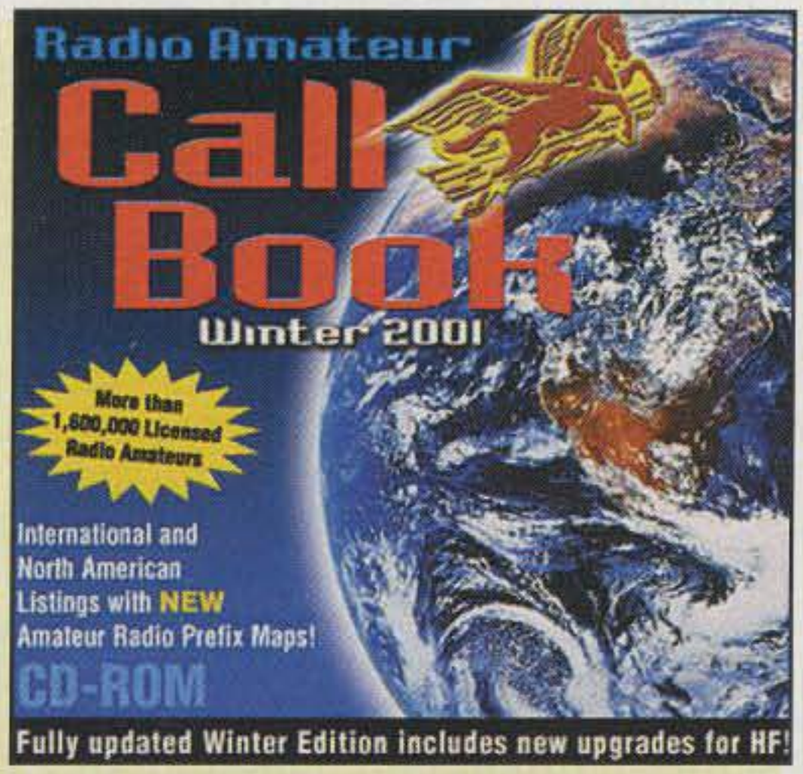
Where is all the ham radio clipart when you really need it? Much of it is found on the Ham Radio ClipArt ® by TK5NN CD-ROM. The CD's current incarnation, offered by Patrick Bittiger, TK5NN, is usable with both IBM-PC and Macintosh computers. It covers a very wide range of themes with its 1350+ graphics images.

The images provided on the CD can be used for any number of purposes. These include use in QSL cards, letter paper, fax messages, business cards, videos, club bulletins, internet websites, videos, T-shirts, and more. A wide variety of themes is available, including QSL card models, ham equipment, headphones, keys, satellites, antennas, rotators, connectors, components, maps, ham fonts, and much more.

Included on the CD is a full-color, indexed PDF file, in Adobe® Portable Document Format, that serves as both a manual and a catalog; it depicts all the CD's images. Best of all is the price, which is $25 U.S. plus $5 U.S. s/h for airmail delivery. Patrick offers a 90-day guarantee for defective disks and generous two-year tech support via mail, phone, fax, or e-mail.

For more information, contact TK5NN Multimedia, B.P. 227, 20179AJACCIO Cedex, France (tel. [33] 495 222 266; e-mail: <tk5nn@tk5nn.com>; web: <tk5nn.free.fr/en/index.html>).

Note: You may find it convenient to order online directly from the TK5NN website. Several ordering options are available. The website lets you sample the contents of the CD, so you can determine if you want to purchase it.



For many years the Radio Amateur Callbooks *have been the trusted "gold standard" upon which the amateur QSL exchange system largely is based. Now original-source callsign data are offered through the Radio Amateur Callbook CD-ROMs. The CDs are available in Winter and Summer Editions; the Winter 2001 Edition, shown here, is current but the Summer Edition should be available shortly.*

Radio Amateur Callbook CD-ROMs. Since 1920 the Radio Amateur Callbooks, in North American and International editions, have been the trusted "gold standard" upon which the amateur radio QSL exchange system largely is based. Amateurs throughout the world used the venerable books, with their familiar "Flying Horse" logo, to confirm over-the-air contacts, since the books provided rather complete and up-to-date address information.

The "classic" paper callbooks were published for several years in tandem with the CD-ROM based versions, which essentially contained the former contents of two entire paperback callbooks. However, a few years ago the venerable paper callbooks were discontinued in favor of all-electronic licensing data access.

The Radio Amateur Callbook CD-ROMs are available in Winter and Summer Editions; the Winter 2001 Edition is current, but the Summer Edition should be available shortly. If the upcoming edition is anything like the Winter 2001 CD-ROM ($49.95), it should sport very current amateur radio prefix maps; cover over 1.6 million United States and international listings; have more than 50,000 e-mail addresses and 54,000 QSL manager listings; be viewable in English, Spanish, German, or French; and display ITU and IARU zones. Colorful maps show more than 250 countries, islands, and dependencies.

Contact Radio Amateur Callbook, 575 Prospect St., Lakewood, NJ 08701; 1-888-905-2966 (e-mail: <103424.2142@compuserve.com>; web: <http://www.callbook.com>).

LogWindows Update Announced. Last November we noted Rick Ruhl's firm, Creative Services Software (CSS), had updated the popular logging program component of the Digital Trio, Log Windows, to version 3.07. Rick tells us that an even newer update adds support for the Kachina and ICOM 706 Mark II G radios, Acom amplifier, Top Ten Devices

band decoder, and more. The new 3.07.32 release includes fixes for the FT-1000 MP with DX Spotting, a minor fix for the parallel-port interface, and the enhanced support for the gear noted above. The new release retails for $69.95; upgrades from release 3.06.15 or earlier are $40. If you bought version 3.06.50 or greater, the upgrade is free.

Contact Creative Services Software, Inc., 503 West State St., Suite 4, Muscle Shoals, AL 35661 (telephone 256-381-6100; e-mail: <sales@cssincorp.com>; web: <http://www.cssincorp.com>).

vTuner and vTuner Plus Update. As we mentioned in last May's column, amateurs are used to communicating with each other over the air, but we often listen to shortwave, AM, FM, and other one-way radio broadcasts. In recent years at least 3000 radio broadcasters—AM, FM, shortwave, and others—have climbed aboard the internet to distribute their signals.

Many of these stations broadcast in the popular RealPlayer™ format. This means that if you possess RealPlayer (a free download from <http://www.real.com>), you can click on a station's website and then hear (and sometimes even see) their broadcasts. The main problem is finding these far-flung internetbased stations and organizing them in a convenient way.

vTuner Free and vTuner Plus have been updated to Version 3.0. The free version has a great deal to offer, and the new vTuner Plus 3.0, shown here and priced at $14.95, introduces many more program enhancements, as described in this month's column. Both versions integrate seamlessly with RealPlayer™, which you must have installed on your PC.

Last May we profiled vTuner for use with RealPlayer. It comes with a massive, built-in station database that makes internet listening and DXing easy. As we said, vTuner Free is a totally free download that displays some advertising banners you can live with. An upscale vTuner Plus also is available. The latter sports several enhancements, such as the ability to schedule stations, shows, and events for playback.

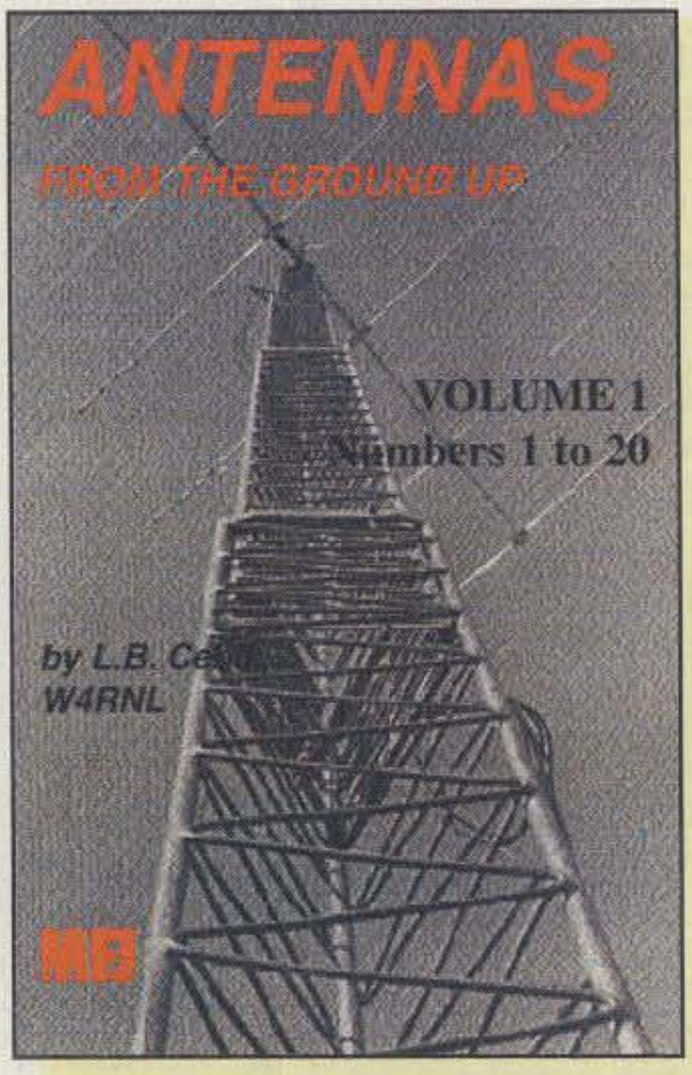
Now vTuner Free and vTuner Plus have been updated to Version 3.0. The free version lets you quickly browse for stations by dozens of formats; easily search for and bookmark stations; sort stations by different criteria; find sports games, concerts, and other events; and considerably more.

The new vTuner Plus 3.0, at $14.95, introduces more program enhancements. These include in-depth station descriptions; detailed program station schedules; enhanced searching; a customizable "personal start page"; and automatic updating of station links. Both versions integrate seamlessly with RealPlayer, which you must have installed on your PC.

The two products are offered by vTuner.com, 215 Park Avenue South, Suite 2008, New York, NY 10003 (212- 477-8722; e-mail: <info@vTuner.com>; web: <http://www.vtuner.com>). However, you can get everything you need, including the program download, simply by going directly to the vTuner website.

From the Bookshelf

Antennas from the Ground Up, Volume 1, Numbers 1 to 20. Written by noted author and antenna expert L. B. Cebik, W4RNL, *Antennas from the Ground Up, Volume 1, Numbers 1 to 20* is a very practical book for technicians, amateurs, and students that provides exceptionally clear and direct information on antenna theory. As such, it offers rational expectations with as much clarity as a non-mathematical treatment of antennas can provide.



Written by noted author and antenna expert L. B. Cebik, W4RNL, Antennas from the Ground Up, Volume 1, Numbers 1 to 20, *is a very practical book for technicians, amateurs, and students that provides exceptionally clear and direct information on antenna theory. (Book cover art courtesy L. B. Cebik, W4RNL and MFJ Enterprises, Inc.)*

The highly authoritative, 21-chapter, 204-page book is based on questions received from operators struggling to set up or improve an antenna within the limitation of modern yard sizes and budgets. Best of all, W4RNL writes in a friendly, conversational mode, as if sitting alongside the reader, trying to anticipate questions that would be asked at each point along the way.

I was intrigued by the "Volume 1, Numbers 1 to 20" designation. It seems that the book's 21 chapters are based on the first set of columns that W4RNL wrote for *Low Down,* the bimonthly publication of the Colorado QRP Club—and he says there just might be a Vol. 2 published someday to pick up more of his *Low Down* columns.

The $19.95 (plus s/h) book is published by MFJ Publishing Co. and is distributed by MFJ Enterprises, Inc., P.O. Box 494, Mississippi State, MS 39762 (phone1-800-647-1800; e-mail: <techinfo@mfjenterprises.com>; on the web at: <www.mfjenterprises.com>).

Long-Path Propagation de NM7M. Bob Brown, NM7M, offers a new book, *Long-Path Propagation: Revisited in Year 2000.* It's essentially a ten-year update and upgrade to his 1992 book, *Long-Path Propagation,* which itself was the result of a year-long study he conducted in 1991–1992. The

new book deals with all the HF bands, 10 through 160 meters, and the new ideas and developments that affect DXing. Bob's book has 10 chapters and 67 figures, which are spread over 91 pages.

The new propagation book is available directly from Bob for $15 U.S., which includes all shipping and handling, foreign or domestic. All proceeds above the cost of printing and postage will be donated to his favorite charity, the Handi-Ham System of the Courage Foundation, located in Minneapolis, Minnesota.

Bob asks that you place orders with him by e-mail at <bobnm7m@cnw.com>. Send checks or money orders to Robert R. Brown, 1105 27th St., Room AW-110, Anacortes, WA 98221-2710. If possible, include a mailing label with your address on it.

Radio-Electronic Transmission Fundamentals. It's not really a new book, but one which nevertheless is noteworthy. Recently, Noble Publishing announced the second edition of the classic *Radio-Electronic Transmission Fundamentals,* by B. Whitfield Griffith, Jr. The book is a highly respected work for mastering the subject of RF energy and gaining an intuitive understanding of how to work with it.

Known as one of the best textbooks of electromagnetic field theory and RF circuits, this is the first reprint since its original publication in 1962. Hailed for its clear and concise explanation of antennas, transmission lines, and RF networks from the perspective of electromagnetic field theory, the book is divided into four major parts: electrical networks, transmission lines, radio antennas, and radio transmitters. Short chapters make the text useful for self-study and as a reference tool for those seeking fast and easy access to the subject of RF energy—and you don't need to know calculus.

Although some of the materials in the book have inevitably been superseded since the original date of publication, the straightforward discussion of the underlying principles, concepts, and components remains timeless.

Contact Noble Publishing Corp., 630 Pinnacle Court, Norcross, GA 30071 (phone 770-449-6774; e-mail: <orders@noblepub.com>; web: <http://www.noblepub.com>).

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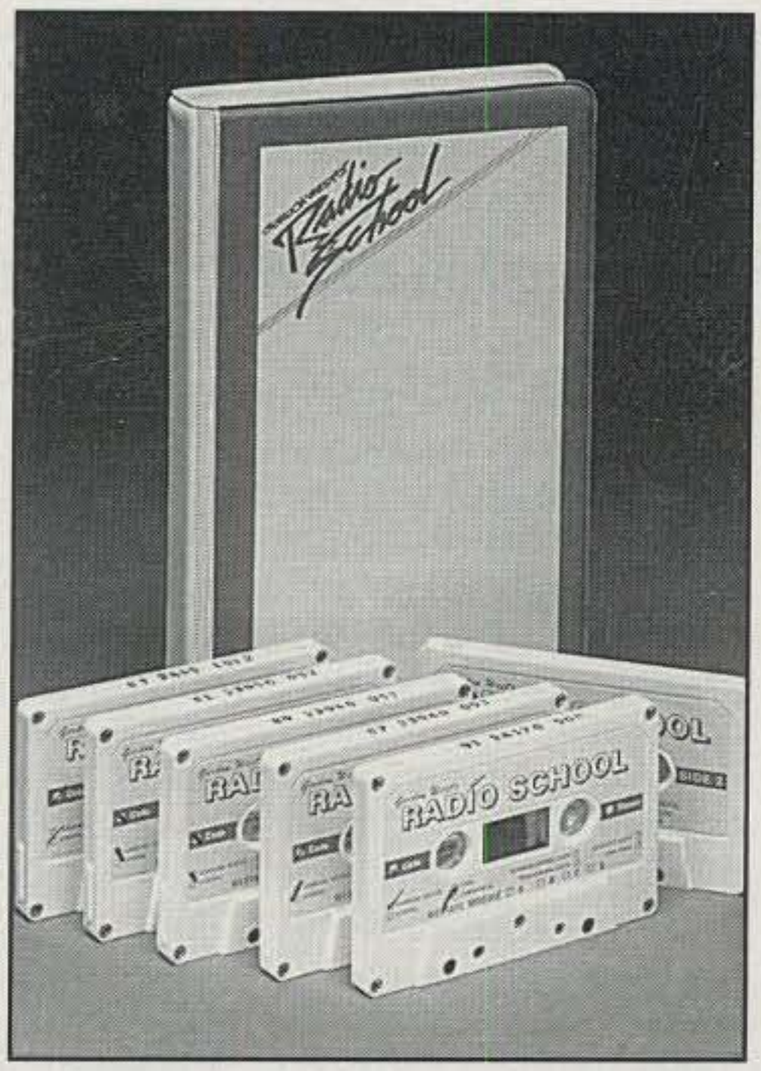

Morse Code instructors can hold their classes over their local repeaters or simplex frequencies with free code-learning cassettes from Gordon West, WB6NOA.

over their local repeater or simplex frequencies with free code-learning cassettes from Gordon West, WB6NOA. Each cassette is 90 minutes long and is recorded monaurally for easy player-to-microphone pickup. All of the code-learning practice is narrated, and the cassettes are ideal for instructors to play over their local repeater system. Instructors also may use these cassettes in the classroom.

CW instructors may receive these cassettes at no charge by including a brief letter describing their upcoming on-air or in-class scheduled code course, as well as ten first-class stamps for Priority Mail delivery. The free cassettes are part of the Ham Ambassador program, and Gordon encourages all instructors and repeater control operators to take advantage of the opportunity.

Send your request and class details to Gordon West Radio School, Inc., 2414 College Drive, Costa Mesa, California 92626 (714-434-0666).

We Get Letters

Once again we're just about out of space in this month's column. Before wrapping things up this time around, however, we would like to acknowledge some of the good folks who corresponded with us in recent months. A tip of the W8FX hat goes to George Hale, WA3SGK; Travis McKee, N5MQY; Jim Roebuck, W4AXO; Bob Beaudet, W1YRC; Will Pounds, K7ROK; and Fred Bonavita, K5QLF.

So, gang, keep the cards, letters, and e-mails coming, and let us know what "new stuff" you'd like to see here.

Wrap-Up

That's all for this time, gang. Next time more "What's New." See you then.

Overheard: In construction projects up-front neatness counts: I've found that how you begin a project usually determines how it looks when it's finished.

73, Karl, W8FX

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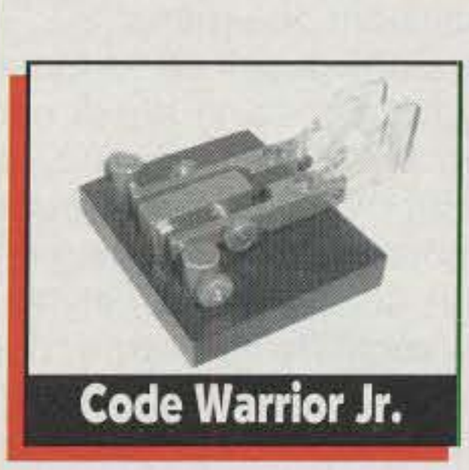
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Beginner's Corner

BY PETER O'DELL, WB2D

For the Newcomer to Ham Radio

Practical Antenna Ideas

Antennas are easy to build and experiment with. Here are some practical ideas for the newcomer just getting started.

When I came into ham radio about a hundred years ago (I haven't really done the math on that one, but my knees and ankles tell me it was that long ago.), building your station or portions of it was popular. There is still a sizeable cadre of diehard builders out there. For me, however, operating was always more important than building. Heaven knows, I thoroughly enjoyed putting together a Heathkit, though. Then, too, there were the totally "homebrew" projects that added much to my operating enjoyment.

I do have one rule of thumb: If it is not much cheaper or better than the commercially available product, buy it and be done with it. There is no way that I, personally, would set out to build a transceiver from scratch, for instance. These days I would have to think long and hard about doing a kit, too. God bless those who do, but those days are in the past for me.

Not so for antennas, though. Over the years I have had more fun experimenting with antennas than any ham activity outside of operating, and it wasn't experimenting for the sake of experimenting. I was always looking for a better-performing antenna.

Recently we have had a bunch of postings on the *CQ* Beginner's Forum regarding antennas. There is a rule in public speaking: If one person in the audience asks a question, chances are another 20 people are thinking about it, but are afraid to ask. A magazine column and web forum are a lot like public speaking, so my guess is a lot of newcomers have the same questions. Thanks to all for having the courage to post the questions.

FM Operation

Let's start with FM operation. Michael (no call yet) had read something about a ham using a mag-mount antenna indoors on 2 m/70 cm to improve handheld performance. Did that mean someone was using a magnetic-mount mobile antenna inside the house? How would that work? Should you place a sheet of steel under it?

These all are fair questions. First, it means what it sounds like. If you are attempting to use your handheld from inside your home and are finding it difficult to make it into your favorite repeater, then a mag-mount antenna may be just what you are looking for. Mag mounts were designed and marketed for the temporary and/or "no holes" mobile market. However, that does not mean any other use would be prohibited or invalid or something. It's just a marketing decision. One of the fine traditions of ham radio is "making do" with whatever you have on hand. Take the term *breadboard,* for instance. In the early days before anyone realized the benefits of a metal chassis, some enterprising ham swiped his wife's breadboard and used it mount all those parts, which became the rig. Hence, today we talk about *breadboarding* a circuit.

Here's the deal. The rubber ducky (stub) antenna that comes with most 2 meter handhelds is pretty inefficient as an antenna. It can easily be improved upon by replacing it with a full-size radiator, such as a quarter-wave or 5/8-wave, if you have the room. What you give up is that you now have to have the antenna attached with a piece of transmission line (coax) and it has to be mounted somehow. In addition, either of these antennas requires a *ground* to radiate properly. Think of ground as an electrical equivalent of a mirror.

Mag mounts are designed to mount on the roof of a car—and not a convertible either. If the car is moving, the only way a mag mount is going to stay on is if it is mounted to steel; magnets work with iron and its alloys, at least that's what I recall from high school physics. As far as I know, that's the only purpose of the magnet: It holds the antenna on the car, assuming, of course, the car is made of steel. As for performance, it is best to put the mag mount in the center of the car roof. The next best place is the center of the trunk lid. Why? Because those are the spots on the car that are the biggest mirrors (ground) for the vertical radiator.

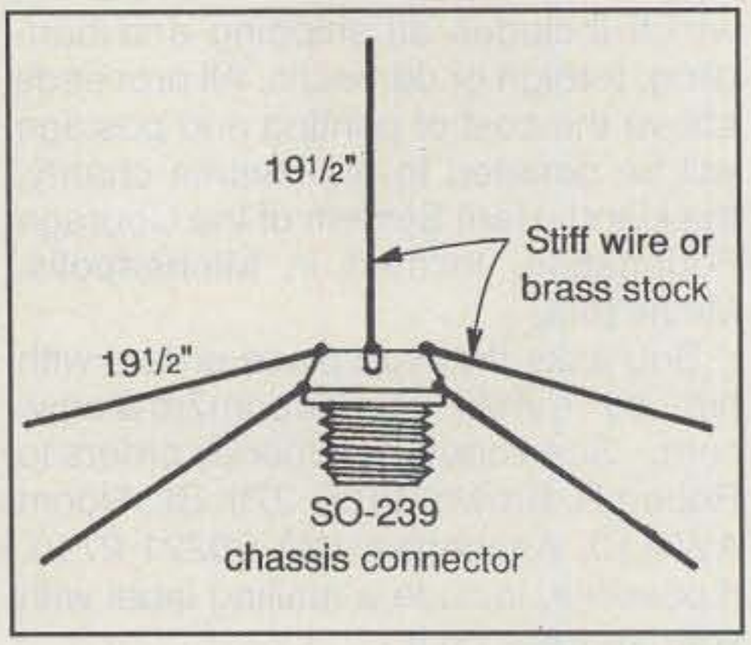

Fig 1– Use an SO-239 as the nucleus for an inexpensive 2 meter ground-plane antenna.

Now let's bring the mag mount inside the house. What do you need for it to function properly? First you need some metal beneath it to act as the ground. How big? The bigger, the better. Second, you want the antenna to stay in place. Therefore, pick something that has some steel/iron in it. In one apartment I lived in I placed a mag mount on top of the refrigerator. It worked fine. Currently I have one on top of a filing cabinet in my home office. Why not the 'frige again? Because the refrigerator has cabinets immediately above it, so there is no room for the antenna. The only rule is finding what works in your house—and what the other household members will tolerate.

There are some places to avoid, though. For example, I would not recommend putting a mag mount on top of your kitchen stove. Why? Well, it's probably going to be in the way of anyone attempting to cook. Second, prolonged exposure to heat will destroy most magnets. Once you understand the purpose of the magnet and ground, it just becomes a matter of common sense.

This is not the only solution, however. You could make a ground-plane antenna. Here you have a quarter-wave antenna above three- or four-quarter-wave radials that act as ground. This is something anyone with a soldering gun can make out of a couple of coat hangers or some brass stock from the hobby shop. For years the *ARRL Handbook* has carried "plans" for this antenna using an inverted SO-239 connector as

*123 NW 13th Street, Suite 313, Boca Raton, FL 33432
e-mail: <wb2d@cq-amateur-radio.com>

the mechanical nucleus of the antenna. The quarter-wave radiator is soldered to the center pin of the SO-239, and the radials are soldered to the four mounting holes. A good mag-mount antenna will cost you $25 or more, while this one will run you about $2 if you buy the connector and brass new (see fig. 1).

An even cheaper possibility (for 2 meters, anyway) exists if you have a large window—and if no one in your household objects to a small amount of ugly. A dipole can be mounted vertical, just as well as horizontally. The only problem is that a typical dipole is made of wire, and it is very hard to get 39 inches of wire to balance on one end. However, if you add a little bit of Scotch® brand tape and a big window into the equation, the outcome definitely can be a lot different.

It is really pretty simple. Just cut two pieces of wire about 19 1/2 inches long and solder them to the braid and center conductor of a short piece of coax. Next tape the wire and coax to the window in the form of a vertical dipole, making sure to keep it away from any metal in the frame of the window (see fig. 2). The cost of this antenna is only pennies, assuming you have the short piece of coax in your junk box. This antenna will work quite well if your family can tolerate this level of ugliness.

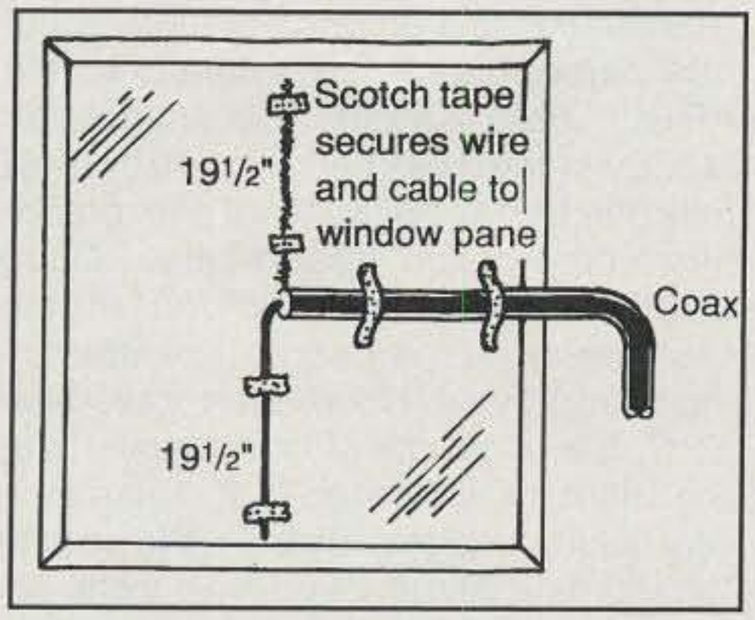

Fig. 2– If you have a large window (taller than 39 inches), you can mount this inexpensive dipole with nothing more than Scotch® brand tape.

These antenna ideas can be scaled to other VHF/UHF bands, and they will work just as well on these bands. Have fun and enjoy.

On to HF

James Austin, Jr., KE4RHN, is a student with a less-than- ideal location for putting up an HF antenna. (If his finances are anything at all like mine when I was in college, then he's probably on a limited budget.) What's the best approach, particularly on a limited budget? A vertical? A G5RV? A long wire?

Well, any one of these options is going to require something else, particularly if you want to operate over a significant portion of the lower bands. Even with a built-in tuner, most transceivers can only handle an SWR of about 3 to 1. With a loaded vertical you are going to easily exceed that limit if you want to operate phone and CW on 40 or 75/80 meters. When I worked at ARRL headquarters, Jerry Hall, K1TD, did a computer analysis of the G5RV over the HF bands. I don't recall all the technical details, but what it showed was that you could expect an SWR of up 10 to 1 in certain portions of the bands. Tube rigs with a pi-circuit output can handle that kind of SWR. Transistors can't. Heaven knows what impedance you are going to see with a random piece of wire. There is only one conclusion.

With a solid-state rig you are going to need an antenna tuner. Built-in tuners are fine, but remember they have a limited tuning range. One of the handiest accessories than any HF station can have is a good antenna tuner. If I were putting together an HF station today, it

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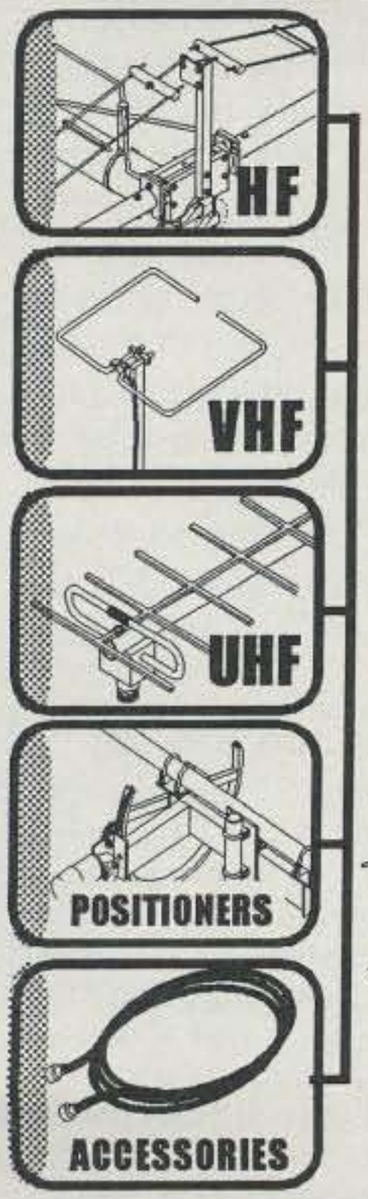

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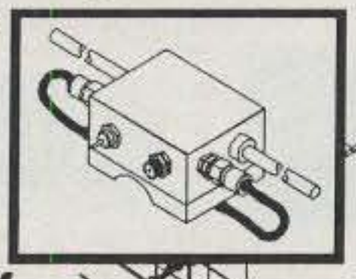

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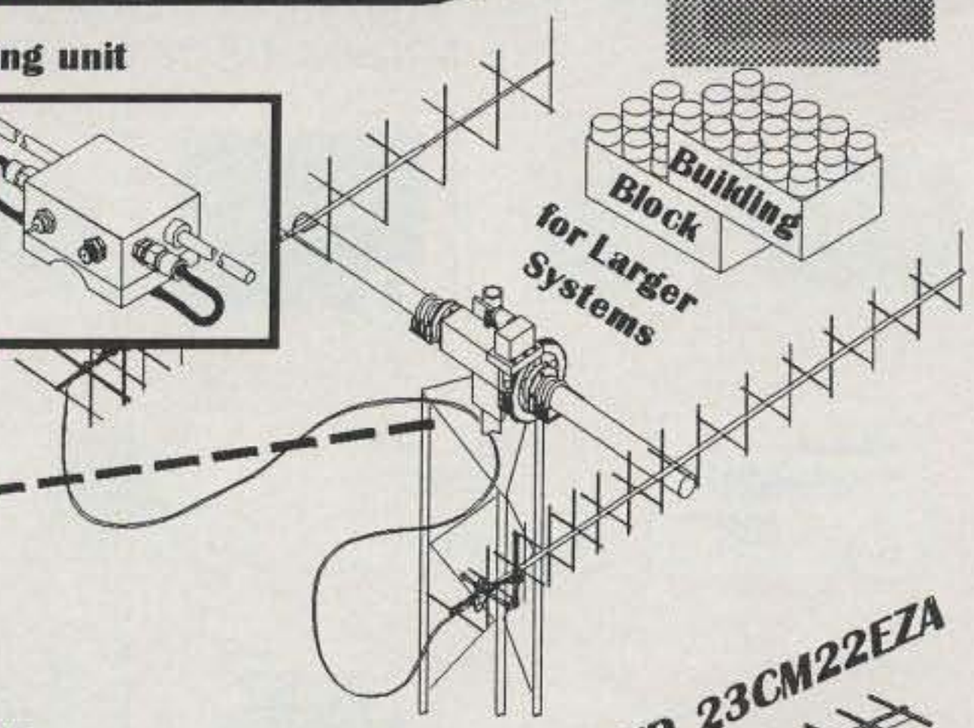

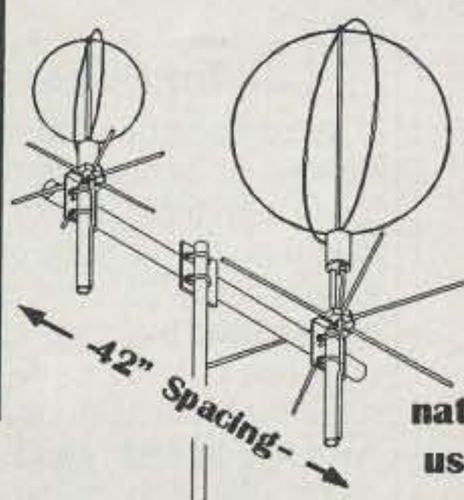

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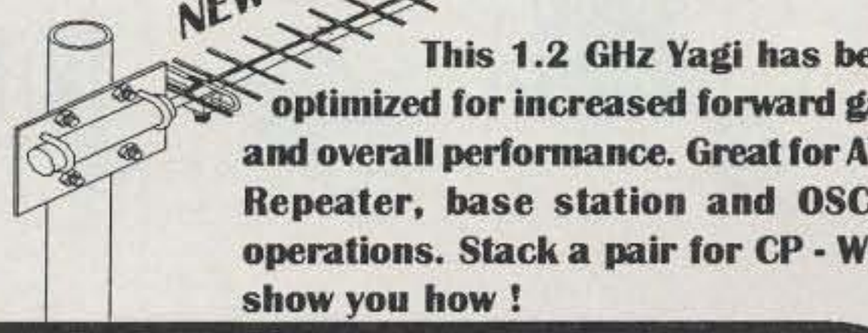

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is the first "accessory" that I would buy or build.

One requirement is the tuner must have a roller inductor. The alternative is to have a multi-position switch and a coil tapped at the appropriate spots. This configuration just does not give you the versatility that a roller inductor does. Sooner or later, too, you might decide to add an amplifier to the station. Also, you might want to use balanced feedline sometime, so it is a good idea to pick one which includes a balanced-output option. You'll want to be able to tune up quickly, and nothing facilitates that more than an accurate turns counter on the roller inductor. Thus, my advice is to get the best antenna tuner with the highest power rating that you can afford.

By the way, this is one accessory that can be built by anyone with a modicum construction skills. Back in the early '70s, Lew McCoy, W1ICP, developed a circuit he called the "Ultimate Transmatch" (*transmatch* is a technically more accurate name than antenna tuner, so the ARRL calls them transmatches). McCoy's circuit has been copied by most manufacturers because of the broadband nature and ease of use. Doug DeMaw, W1FB, was no fan of the Ultimate, so he spent some time attempting to improve it. His version, called the SPC, had a couple of advantages over the Ultimate. However, it also has several disadvantages. My vote is to go with the Ultimate circuit, if you have a choice.

Once you have the antenna tuner, you can use it with just about any antenna going. Vertical, G5RV, random wire, dipole—it doesn't matter. No matter where your antenna experiments take you, the tuner will be a plus.

Robert Van Patten, W8ZHJ, is thinking about using a camera tripod along with a 40 meter mobile antenna for portable operation. He wanted to know what forum members thought of using sticky-back aluminum tape on wooden dow rods for radials.

HF radials and ground are like their VHF cousins. A quarter-wave ground-mounted vertical and a ground plane are somewhat different beasts. Let me clarify this. What I am calling a ground-mounted vertical is an antenna in which the feed point is a few inches above ground—the earth, not necessarily electrical ground, but the soil itself. A ground-plane antenna is one in which the feed point is a few feet or more above the earth.

My experience has been this: If you are dealing with a ground-mounted vertical, you had better have lots of radials unless you live on a swamp or a sea shore. How many? Some research has suggested that it takes over 100 radials to get optimum results. On the other hand, raising the feed point a few feet above ground seems to reduce drastically the need for radials. I once had a 40/80 meter vertical with only two radials per band, and it worked very well. It was mounted just above my head (at about 6 feet), as were the radials, and the soil definitely was not that good.

Please note: I am talking about quarter-wave antennas. A half-wave antenna needs no radials whatsoever.

Thus, my advice to Van was to ditch the camera tripod. Find a convenient tree limb and throw a piece of nylon rope over the limb. Use the rope to suspend the 40 meter mobile antenna, raise it as high as convenient (at least 6 feet), and use a couple of wire radials attached to other trees at about the same height.

Stop by the Beginner's Forum and join in or just browse. Because of the delay between writing an article and having it published, the messages I've mentioned here probably won't show up when you first stop by. Notice at the top of the screen there is a dialog box stating that these topics have been active in the last 30 days. Click the box down arrow, and you will be able to select other time frames, up to a year. Join us.

73, Pete, WB2D

Call for Photos and Stories

We'd like to hear from you about your experiences as a newcomer. If you have questions, we'll try to incorporate them into future columns. If you have photos (color prints or slides okay) of your station or antennas, please send them along and we'll publish the best ones. If you have a solution to a common problem that new hams experience, we'd like to hear about it so we can pass it along. You can contact me at <wb2d@cq-amateur-radio.com> or Peter O'Dell, WB2D, Beginner's Corner, 123 NW 13th St., Suite 313, Boca Raton, FL 33432.

QRP

BY DAVE INGRAM, K4TWJ

The Art of Low-Power Hamming

What's Happening in QRP? Plenty!

Plus a Mini-Review of the Elecraft K1

Recently, a number of assumed normal (?) friends reported they have become hopelessly addicted to QRP. They cited this column plus your author as the responsible parties. Furthermore, a few folks even demanded we include a general statement of warning herein to inform occasional readers of unsuspected repercussions. That sounds like a fair and reasonable request we should honor, so . . .

Caution! Failure to investigate all the exciting new QRP gear and fantastic on-the-air QRP happenings during this time of high sunspot activity and great band conditions can lead to unnecessary boredom! If left unchecked, even seriously motivated amateurs may be downgraded to "junior ops" with only vague memories of effective contesting and DXing techniques!

Don't let a good ham go bad! Begin taking corrective measures right now by gearing up with a little 5 watt rig of your choice and hanging out around popular QRP frequencies such as 14.060, 28.060, and 7.040 MHz. Life is good. Enjoy it! Dave is behind you all the way! Need more encouragement? Maybe our following overview of another hot new QRP rig and some super-fun on-the-air activities will pique your interest. Read on!

Photo A– Elecraft's new K1 two-band CW transceiver sports a sensitive receiver, solid 5 watt transmitter, and built-in keyer and measures only 2.2"H × 5.2"W × 5.6"D. The little unit was designed by Wayne Burdick, N6KR, of QRP fame, and is available in kit form from Elecraft, LLC. (All Elecraft photos courtesy Elecraft)

The K1 Up Close

As we all know, getting on the air with a neat go-anywhere rig is the "secret ingredient" that keeps life in the QRP lane super-attractive day after day and year after year. In light of that noteworthy fact, let's kick off this month's column with an up-close look at Elecraft's new K1 dual-band CW transceiver kit shown in photos A, B, C, D, and fig. 1.

This little gem is quite small, yet it sports some big-rig features and covers any two owner-selected HF bands between 80 and 10 meters. A contester might set it up for operation on 40 and 20 meters, for example, while a wild WARCer would set it up to work for 30 and 17 meters, etc. The K1's receiver section is single conversion with a four-pole IF crystal filter, three selectable bandwidths, RIT, XIT, and audio-derived AGC. The transmitter section has three stages with 100 milliwatts to near 7 watts output, full break-in operation, diode T/R switching, CW sidetone, and built-in keyer with two memories. Keyer speed is front-panel adjustable from 8 to 50 wpm, and memories include selectable auto-repeat/beacon plus "piggyback"/combined play functions. A noise blanker and an automatic antenna tuner (both of which fit internally) are avail-

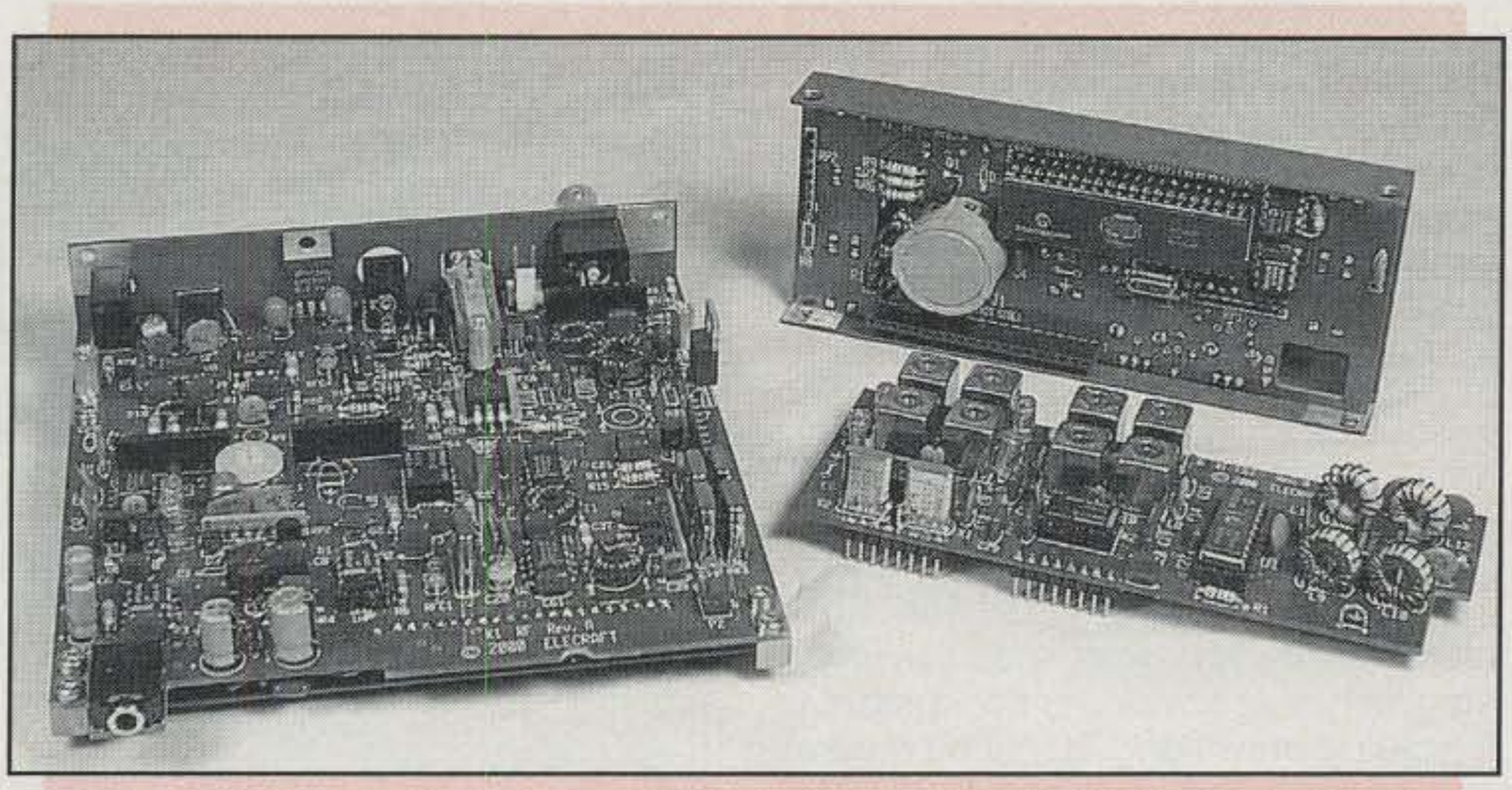

Photo B– Here you see all three of the K1's PC boards assembled and ready for installation in the kit's supplied case. Main RF board is on the left, front-panel board is in the upper right, and the two-band filter board that plugs into the main RF board is in the lower right.

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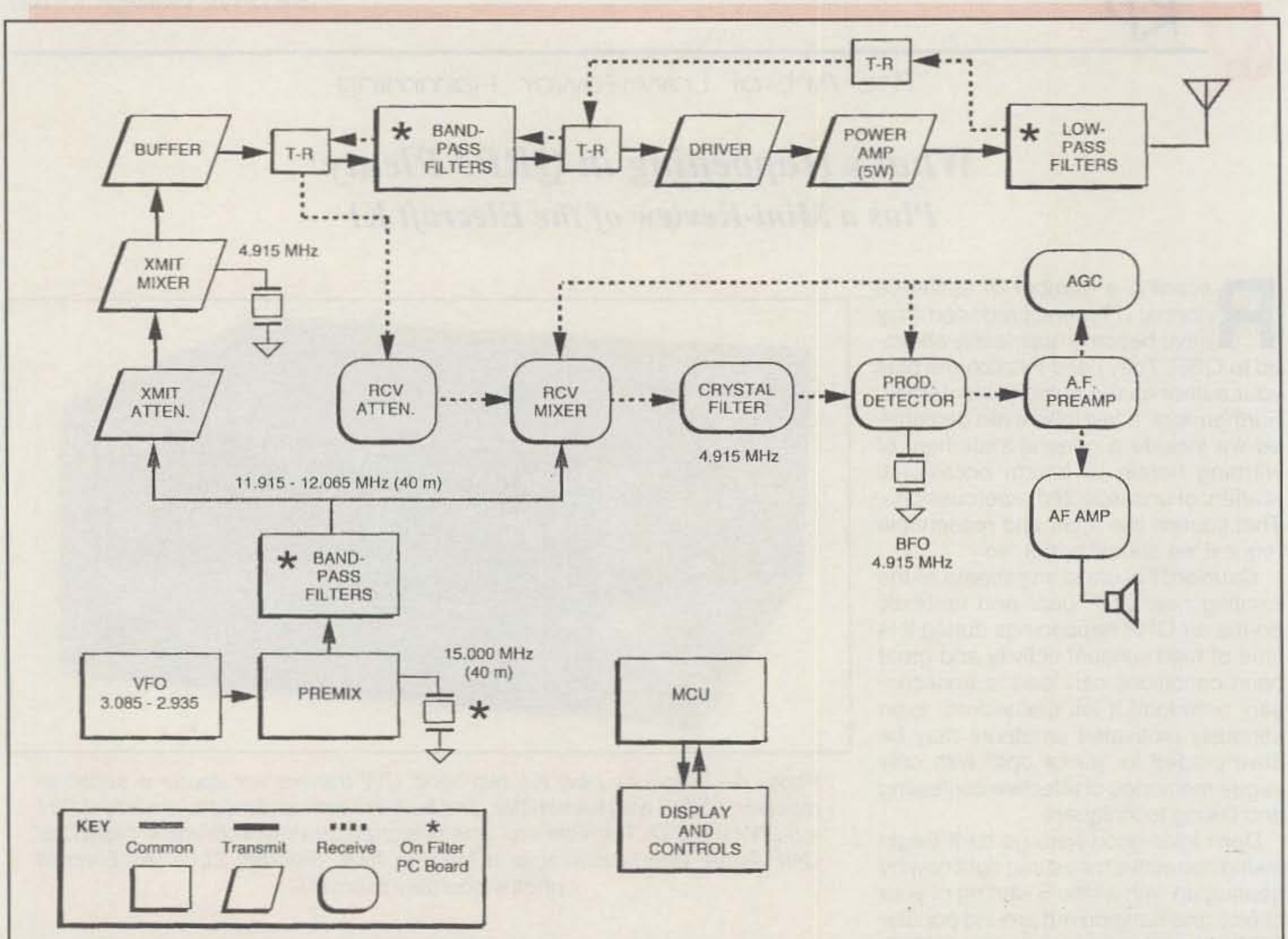

Fig. 1– Simplified block diagram of the Elecraft K1 QRP transceiver. (Discussion in text.)

able as options. A multifunction LCD readout on the front panel indicates frequency, output power, received signal level, supply voltage, and keyer speed, plus serves as a frequency counter and DVM for alignment.

In an effort to maximize flexibility, front-panel pushbuttons serve double-duty by including "quick tap" and "hold depressed one second" functions. Tapping the left top "band" button changes bands, for example, while holding it pressed down selects the LCD mode (S meter, power, voltage, keyer speed, etc.). Study photo A and you can see additional secondary functions of pushbuttons marked on the front panel.

Aside from its small size (and fancy features!), the K1's main "genuine QRP" attraction is its low power consumption. It typically draws only 50 ma on receive and around 1 amp on transmit—ideal for traveling or in-field use. In fact, the K1 can even operate from a high-current/lithium 9 volt battery for ultra-light portable stints.

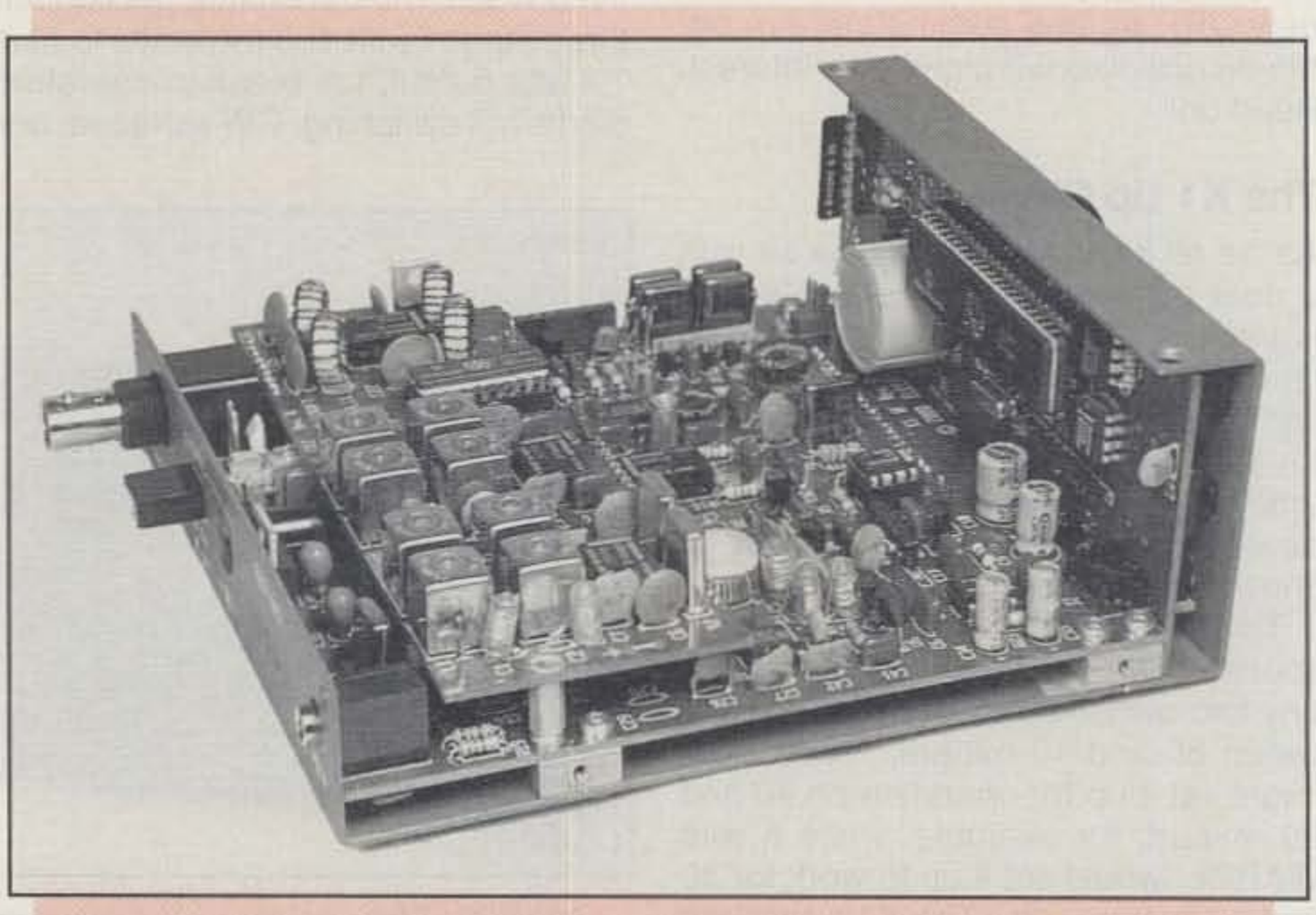

Photo C– This shot shows all three PC boards installed in the K1's case with top and side panels removed for study and alignment. All PC boards plug in; there are no interconnecting wires.

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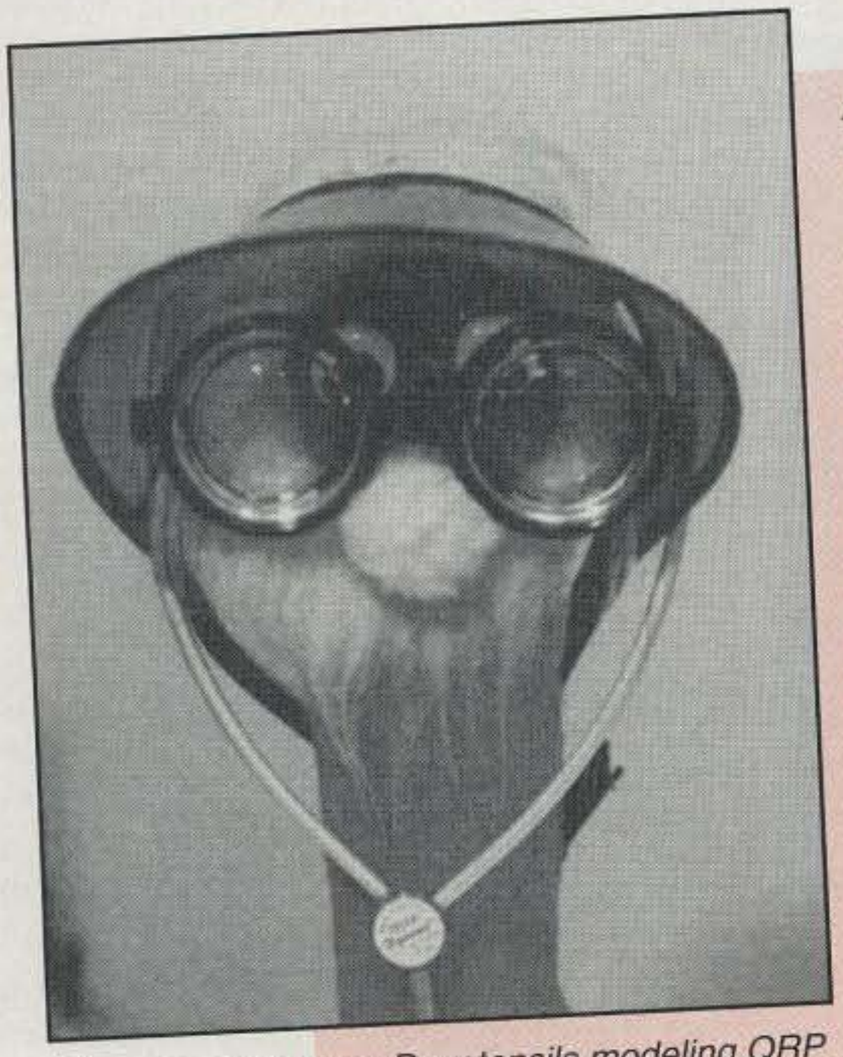

Alternate op Rodney Dovetonsils modeling QRP Goggles and Telegrapher's visor.

April Special:

The Ultimate QRP Accessory— Dr. Dave's QRP Goggles and Optional Telegrapher's Visor

Have you ever noticed how serious DXers stare transfixed at their rig's dial or LCD readout when straining to copy weak signals? It is a natural instinct and a famous old-time tradition, and it really works! Yes, and now you (yes, you!) can enjoy that same big-time radio advantage with Doctor Dave's QRP Goggles and optional Telegrapher's Visor. The goggles are fitted with ultra-strong magnifying lenses to help you focus on every fine line and tiny dustball in your transceiver's display. They work right down to 10 dB below S1! The optional visor is guaranteed to add at least 5 wpm to your code speed. Watch out Ted R. MacElroy. We're red hot and cooking! Goggles and visor are available from K4TWJ for 16 smackers and 2 Vibroplex key boxtops. Allow six months to two years for delivery. All orders must be mailed on April 1st.

Although the K1 is designed as a two-band rather than a multiband transceiver, its combination band and filter board is field changeable. As shown in photo C, the "band board" mounts above and its pins plug into a socket on the main RF board. If you build a second-band board, opening the K1's cabinet and swapping the boards is only a 3 or 4 minute affair. Frequency cover-

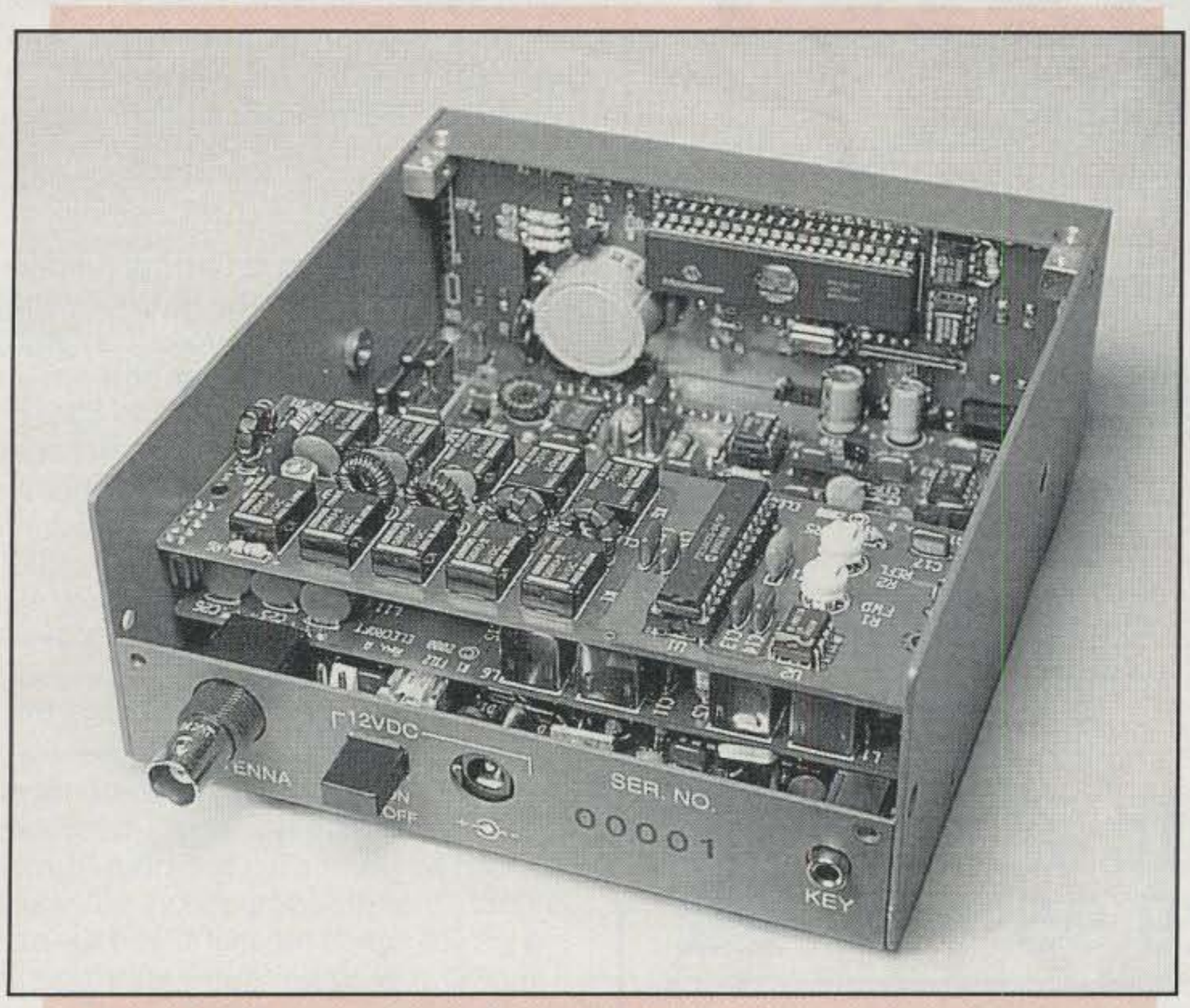

Photo D– This rear view shows the K1's optional automatic antenna tuner board installed above its two-band filter board, resulting in "three-story construction." The black rectangular items on the board are miniature relays that switch in various coil/capacitor combinations.

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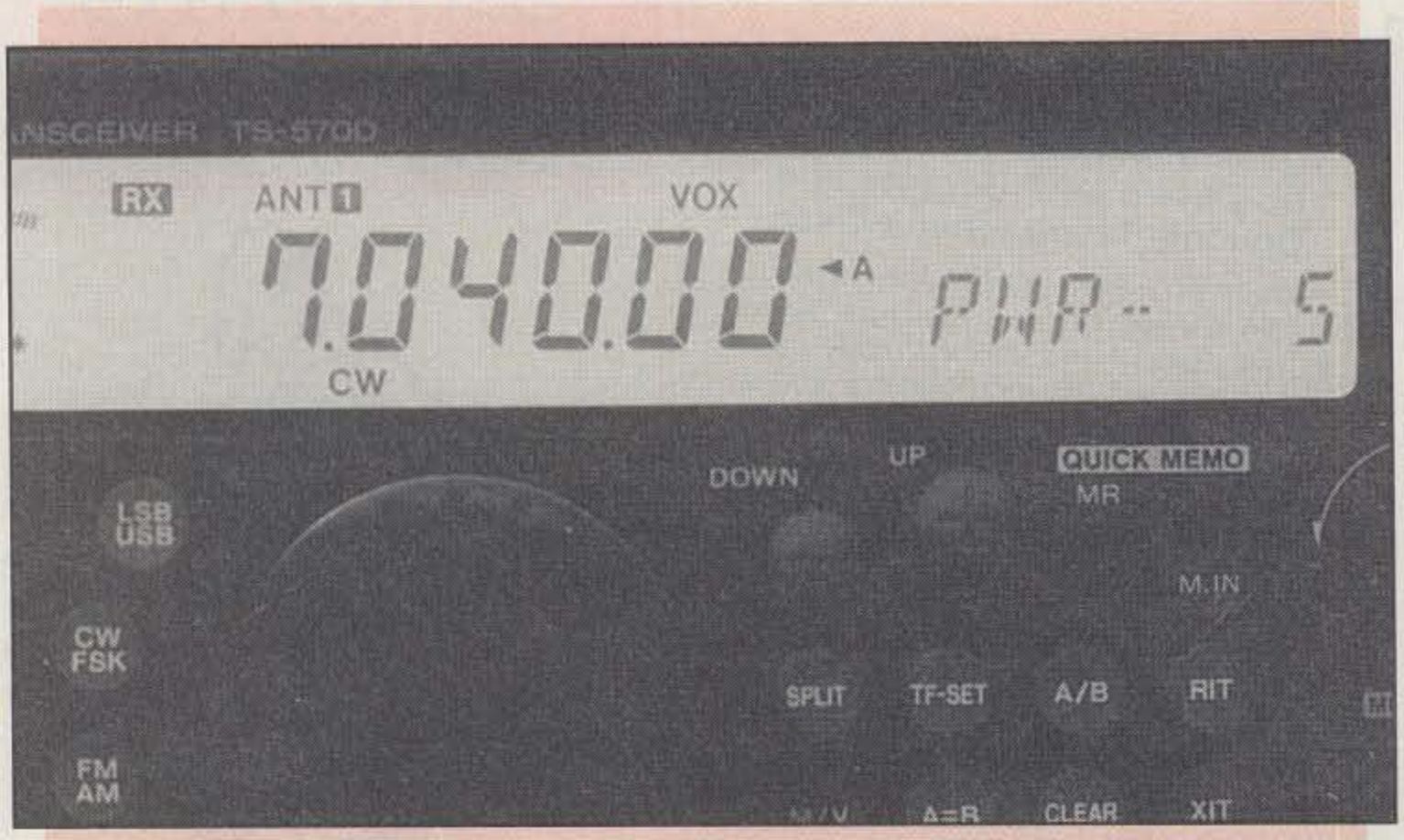

Photo E– The fun starts here! Tune in the popular QRP frequency 7.040 MHz one weeknight, listen carefully, and you may hear a fox hunt in progress. Joining the chase is easy. (Details in text.)

age on the bands, incidentally, can be set at 60 or 160 kHz, as desired.

Technically speaking, the K1 sports some solid design ideas with good use of performance-proven ICs and transistors (fig. 1). Popular SA602 ICs, for example, are employed in the receive mixer, product detector, transmit mixer, and VFO mixer, while a 2SC216 serves as a transmit driver and a 2SC1969 handles PA duties. An LM386 functions as an AF preamp driving an LM380 amp which, in turn, drives earphones or the built-in speaker. The VFO is variactor tuned with a 10-turn pot; it is double regulated so it will maintain stability right down to the 8.5 volt level (nice to know when you are out somewhere between lost and found with only one battery).

How challenging is the K1 to build? I bounced that question off Elecraft's Chief Operating Officer, Eric Swartz, WA6HHQ, and he stated a number of "first timers" have successfully assembled K1s in 14 to 16 hours. More experienced builders have put the transceiver together in 9 to 10 hours. The kit's parts count is rather high (around 400 parts), but there is no point-to-point wiring to cause problems. Everything just plugs in or mounts to marked points on PC boards. Nice!

Overall, the Elecraft K1 promises to be a hot item in the world of QRP, especially among the homebrew-oriented and budget-conscious crowd. Thus far (January 2001), I have heard only three or four of them on the air, but they sounded good and their owners were quite excited about them. You can get more details on the little K1 or its "big brother," the K2 (and order either one) by contacting Elecraft at Box 69, Aptos, CA 95001-0069, telephone 831-662-8345, or on the web at <www@elecraft.com>. Tell them Dave sent you!

After the Fox!

The fun and games in QRP are indeed endless, and one of the more recently included activities everyone can enjoy right from home is an on-the-air fox hunt. If you tuned around 7.040 MHz on Tuesday or Thursday evening between 0200 and 0400 UTC in recent months and listened carefully, you probably heard a fox hunt in full swing (photo E). The chase typically starts with a predesignated station calling "CQ Fox," and then other stations (the hounds) clamor to contact him/her or "bag a fox." A rather substantial pileup of stations running 5 watts or less mushrooms almost immediately and continues through the hunt's full two hour "run." It is good, friendly competition, a rewarding way to spend the night, and it is also a terrific way to fine-tune your operating skills.

Indeed, working a fox calls for thinking like a fox, outwitting the "wolf pack" and continuously evaluating everyone's operating savvy (including your own!).

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If the fox consistently works other stations faster than you can pump out your call, for example, your transmission is probably too long, your CW too slow, or your fist too inaccurate for easy copy. A higher speed, more exact and/ or more precisely timed call is in order. If a pile-up is several kHz wide, spotting each hound (err . . . station) wrangling a QSO, visualizing how the fox runs (ahh . . . tunes), then placing your call in that unavoidable path (err . . . spot) is clever thinking. The list could continue almost indefinitely.

Listen for that magic moment of silence right when (and where) the fox is listening, then insert your call once—and only once—in that spot. Strive to improve your Morse copying speed. Use full break-in operation so you can hear on-frequency activity between your dots and dashes. Develop the ability to copy weak replies while ignoring other on-frequency callers (tuning in a desired station at a very low tone and then ignoring high tones often helps). Fine-tune your antenna system (see our "How It Works" column next month for tips). Heed our suggestions for a couple of months, and you should emerge as one sharp QRPer and a good fox-hunting hound.

The winter fox hunt wrapped up during the first week of March. A similar summer fox hunt is scheduled to get underway soon. Early reports indicate Marshall Emm, N1FN, owner of the Morse Express and Oak Hills Research, may be the lead fox with an all-time record of 133 "hounds" QSOed in one night (over 40 foxes and several hundred hounds were involved in the extensive winter hunt). This report is being written during late January, so lead hounds (those working/bagging the greatest number of foxes) are still unknown. Final scores plus details on upcoming fox hunts are posted on the web at <www.CQC.org/fox>. Check it out, sign up to be a hungry hound or fox in the next hunt, and tune in the action on 7.040 MHz one night soon! Now let's squeeze in a quick technical tip.

A Helpful Tip

Sometimes our test equipment alerts us to more facts than expected. How so? A couple of months ago I connected one of my favorite QRP transceivers to my known to be good 30 meter antenna, quickly checked the SWR to confirm everything was okay, and—egad—the SWR measured 2.5:1 and my output registered 7 watts. I dashed outside to ensure the antenna was still up and its feedline secure. Yes, everything was okay. After returning to the shack, I switched to my backup antenna. Its SWR was also high! Shifting over to my main transceiver, the SWR on both antennas measured 1.1:1 as usual. What would you say caused this idiosyncrasy? An intermittent connector? Broken coax?

After checking further, I found the QRP transceiver was producing an out-of-band "spur" (spurious radiation) that the SWR meter was registering as reflected power. The spur was weak; otherwise it would have "pegged" the SWR meter. Readjusting idle current on the transceiver's power amplifier stage solved the spur problem, and the SWR returned to 1.1:1 as usual. A friend experienced a similar problem with his big 100 watt rig, incidentally, and resetting power-amplifier idle current also solved the situation. Remember this dink note if you experience unexplained spurs or high SWRs with one of your favorite rigs in the future.

Conclusion

That winds down the news and views for now, gang, but stay tuned for next time when we spotlight more hot QRP news and views. Looking down the line, we also plan to include details on my original QRP antenna—the end-fed dipole (which you also can purchase from me at a less-than-build-it-price). Other topics to be featured include updating details on popular QRP rigs such as the SGC-2020, MFJ monoband transceivers, and a "how its doing after in-field use for several months report" on the Yaesu FT-817. *(Look for a full technical review of the FT-817 by N7RR in an upcoming issue.—ed.)* We will also spotlight the new FT-817 carry case from Cutting Edge Enterprises. This year promises to be great for QRP. Let's all enjoy it to the max! 73, Dave, K4TWJ

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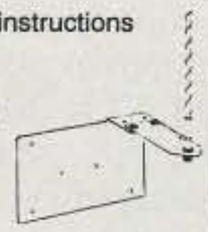

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BY JOE LYNCH, N6CL

All About The World Above HF

Sunspots—It's Downhill from Here

According to NASA Space Flight Center's Dr. Tony Phillips, this past mid-February the Sun underwent a flip in its magnetic field. Commenting on the Sun in an article entitled "The Sun Does a Flip" (posted on <http://science.nasa.gov> on February 15, 2001) Phillips wrote, "The Sun's magnetic north pole, which was in the northern hemisphere just a few months ago, now points south. It's a topsy-turvy situation, but not an unexpected one."

Phillips quotes David Hathaway, a solar physicist at the Marshall Space Flight Center, as saying, "This always happens around the time of solar maximum. The magnetic poles exchange places at the peak of the sunspot cycle. In fact, it's a good indication that Solar Max is really here." Which is the point of the title of this section. According to NASA's observation, we are now past the peak of the current sunspot cycle.

As peaks go, this certainly has not been a barnburner. For those of us who remember the previous cycle, we can recall that communications on 6 meters was wild at times, with many hams completing DXCC and new distance records being set. This cycle has not produced many such spectacular openings. Even so, the decline of this cycle is expected to be somewhat extended. This means that the potential for fairly good *F2* openings does exist for the next year or so. Solar minimum is expected to be somewhere around 2006–7.

Speaking of 6 meters...

According the ARRL DX bulletin, the administration of Monaco (3A) has authorized 6 meters for amateur use. Laura, 3A2MD, is attempting to get equipment set up for this band. On the other side of the world, in French Polynesia (FO), F5DYD is now QRV as FO5RA for two years. Look for him on 6 meters around 0700 to 1700 UTC and 28470 kHz around 1630. The QSL route is via the operator's instructions.

Activity reports include the following: From Julio, WP4LNY, on January 1 he heard LU9EHF/B, CX1CCC/B, and ZD8VHF/B. He worked PY2CTD, LU7FN, and LU1ECZ. On January 6 he worked PY2YU and PY2EYE. On January 9 he worked PY2HN and PY2QY/P. On January 22 he worked PY2CDS, CX6ACY, LW3EA, and LU1EDH. On January 23 he worked PY3SOL, PY3JDV, CX9AF, and CX1AO, all on 2 meters. Additionally, he worked LU6HFQ on 6 meters. On January 24 he worked CX9AF. On January 26 he worked LW3HBV, CE3SAD, and PY3SOL. He again worked CX1AO on 2 meters. Finally, on January 27 he worked PY2WC, LU1ECZ, PY1WMJ, PY1AMF, PY1NDX, PY2BW, and LU3ET.

Also on January 27, Jon Jones, NØJK, reports the following, "After almost a month of drought here in the Midwest, the 6 meter band showed some signs of life Saturday January 27, 2001 with *F2* to HC8 and sporadic-*E* to 2- and 8-land.

"The HC8GR/b 50.035 MHz was into EM17, KS for about 30 minutes January 27 (1509–1533 UTC). This is the first time I have heard it in 2001. The Galapagos beacon was heard January 27 across the southeast and Gulf coast states by K2RTH EL95 in FL, WA5IYX EL09 and KA5DWI EM12 in TX, WA4HFN EM55 TN, K5SW EM25 OK, and NØJK in EM17 KS, among others. The beacon was pretty weak for me with meteor pings on it. I suspect EM17 was on the fringe of the *F2* hop. Stations farther south reported louder signals. K2RTH, WA4HFN, KA5DWI, and WA5IYX had the beacon up to 599. NØLL in EM09 had no copy on the HC8GR beacon but did hear some 5s on 6 meter *F2* backscatter.

"Around 1730 UTC VE9AA worked PYØFF on 50.105 and several W1s worked 6W1QU! Solar and geo-magnetic field conditions were not that impressive: 1500 UTC SFI=166, A=9, K=1, with the K going to 2 at 1800 UTC. Solar Cycle 23 still has some life for alert 6 meter DXers!

"As the HC8GR beacon faded out here in KS, single-hop 6 meter sporadic-*E* popped up to New York and Ohio. Made the following 6 meter QSOs: K8ZES, FN02; W2DSI, FN02; and WA8TTZ, EN91. He worked NØKQY in DM98 after me. Continuing, I worked K8DJF, EN90, and KC8KYW, EN91. Both K8ZES and WA8TTZ were 59+ at times. NØLL worked three "8s" while running only 10 watts. It is kind of unusual to have a sporadic-*E* opening this late in the winter season. It would have been nice to have had this sporadic-*E* opening last week in the VHF contest!

"The 6 meter beacons helped spot both openings. K8ZES told me he heard the NØLL/b 599+ about 1550 UTC, then started calling CQ and several stations spotted reception of 6 meter beacons via sporadic-*E* on the 50 MHz 'prop. logger.' If not for the HC8GR 6 meter beacon, we would not have known there was 6 meter propagation between the Galapagos Islands and the U.S."

AO-40 Spins Along

The wait continues for the Phase 3-D satellite, now known as AO-40, to come into regular operation. According to AMSAT-NA, "[the satellite] is still in its seasonal limitations which will (naturally) end by [later this month]. If the announced despinning routine is successful, the (major) planned recovery efforts of AO-40 could begin earlier. Testing of this software routine is now underway."

The S-band beacon (on 2401.323 MHz) has been heard regularly since late December, and it has been the major glimmer of hope on the satellite thus far.

VHF Plus Calendar

April 5	Moon perigee.
April 8	Full Moon. Moderate EME conditions.
April 9	144 MHz Spring Sprint. (See text for details.)
April 14	Lowest Moon declination.
April 15	Last quarter Moon. Very poor EME conditions.
April 17	Moon apogee. 222 MHz Spring Sprint.(See text for details.)
April 20–21	Southeast VHF Society conference. (See text for details.)
April 22	*Lyrids* meteor shower predicted peak. Moderate EME conditions.
April 23	New Moon. *Pi-Puppids* meteor shower predicted peak.
April 25	432 MHz Spring Sprint.
April 28	Highest Moon declination. Six Club Sprint. (See text for details.)
April 29	Moderate EME conditions.
April 30	First quarter Moon.

** EME conditions courtesy W5LUU*

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Even so, through interpretation of the signal strengths and telemetry from the satellite, AMSAT personnel have determined that it is spinning too fast and must be slowed before the next move is made in orbit adjustment and to be able to determine what is and what is not working properly onboard the satellite.

According to AMSAT-UK, "AO-40's situation is stable with good battery conditions. There are still strong hopes that the ATOS motor can be used later to adjust the orbit to something more suitable to general communications.

"Although optimism is certainly not a guarantee of future success, AMSAT continues to believe that there will be successful long-term amateur radio communication through AO-40."

For the latest information on AO-40, see AMSAT's URL at <www.amsat.org>.

The Easiest Code to Take

It was more than 30 years ago when I learned the Morse code for my Novice class license. My next-door neighbor, Earl Wiederhold, K6SMT (now a silent key), was the source, inspiration, and impetus for my learning the code. He had code records that the military used, so I knew that if I was learning the military way, I was going to do it right. Even so, for me learning the code was a grueling process of rote memorization. I learned each letter and its uniqueness a few at a time, beginning with all the characters that had only dits, then all the characters that had only dahs, and so forth. Gradually, I worked up to the awful code speed of 5 words per minute.

Finally the day came when I had copied enough records successfully to demonstrated to Earl that I would be able to pass the real test. Earl sent away to the FCC for the Novice exam for me. In due time it arrived, and Earl was ready to administer the test. I had to demonstrate to him that not only could I receive the code at 5 wpm, but that I could send it as well.

Earl put on the code record and let it play. With pencil in hand I copied it, letter by letter. Somehow, over the course of the five minutes I managed to string together 25 characters in a row, enough to demonstrate that I was proficient with the code.

It was about six weeks later when I finally got my ticket in the mail. I was duly licensed as WV6PDE, with all the privileges and responsibilities of a Novice class ham radio operator—but only for one year! Because of this short time limit, I knew I had my work cut out for me in getting up to the 13 wpm code speed for the General license. I was pretty careful about practicing my code speed, both on the air and via Earl's code records. However, one day I backslid.

In those days we Novices had voice privileges on 2 meters. One Sunday afternoon after having been licensed for a little over a month, I got on the air from a local's house, using his old 2 meter Gonset transceiver. All afternoon I operated on voice. I loved it. However, my code speed didn't. That evening I resolved to stay off voice until I passed my General code test.

For the next month I diligently worked on increasing my code speed. When spring break rolled around, I felt that I was ready. I was able to get a ride from the mother of a school chum who drove us both to the FCC office in downtown San Diego. It was on a balmy early spring Wednesday morning when I made my first attempt at passing that test.

Again the code test was grueling. Mr. Cruz, the FCC examiner in charge of the San Diego district office of the FCC, administered the test to about a dozen of us. He gave us the usual lecture about not cheating and what it took to pass (65 letters in a row over the five minutes). Then he started the tape.

It was a paper tape and I thought that if I was close enough to it, I could read the punches in the tape. However, the words "no cheating" rang in my ears, so I hunkered down and gripped my pencil. Five minutes was an eternity, and then it was over and we handed in our papers.

From across the room I could see my buddy's face. He didn't look good. (Eventually, I learned that he hadn't passed his test.) I had my own test to worry about, though, so I concentrated on it. From outside of Mr. Cruz's office I had a clear view of him. Even though I couldn't see directly which paper he was grading at any given moment, somehow I knew precisely when he picked up my paper to grade it.

I was glued to watching him as he began making his way through my test. I anxiously watched as gradually he began his count of the letters I had copied. I saw him shake his head. My heart momentarily sank. He then resumed counting, and I became a little bit encouraged. Then I saw him shake his head again. Now my heart was really in my tennis shoes. Yet he started counting again. My hopes increased, but not as much as at the beginning of his grading my paper.

Finally, he put a mark on the paper and then put down his pencil. He walked out of his office directly toward me with a straight face. To me he almost appeared somber. As he got closer, I just knew that I had failed. I started telling myself all of the "if onlys," such as if only I had not spent that afternoon on voice, I could have gotten my code speed up just a bit more.

When Mr. Cruz finally got to my table, he spoke: "Son," he started, and I cringed while I listened for that "failed" word to come out of his mouth, but it didn't. He continued: "You barely skimmed by. I

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counted 64 characters. Then a break. Then I counted another 64 characters and another break. However, on the last set you managed to copy 66 characters before yet another break in your copying. Congratulations!"

It would be 15 years before I would sit for my Extra code test. Again I was before Mr. Cruz. He didn't remember me, but I sure did remember him. This test, however, was a breeze. Those 15 years of mostly CW operation had paid off. I had no trouble with the code test, copying well in excess of the required 100 characters twice during the five minutes of the test.

What I went through to pass the code for my ham licenses I wouldn't want to wish on anyone. I never had the "I did it the hard way so should you" attitude. Yet, in a way, I am glad that I do know the code because it always will be with me always. It's like a good, old friend.

While I think of it as a good friend, I also think of it as another language—a foreign language. As a youth, as almost all youth are, I was more wired to learn a foreign language, thereby making it easier for it to intrinsically become a part of my subconscious. For some reason, and linguists don't exactly know why, as we reach adulthood our ability to acquire a new language decreases markedly.

This lack of language acquisition skills, I believe, is the root of the majority of hams' difficulty with learning the code. We wait until later in life to become hams, thereby exacerbating the problems associated with learning the code by our advanced age. Even so, it is not impossible for anyone to learn the code and pass the easiest code test.

A lot has happened in the 30 years since I passed my first code test. Most of what has happened occurred in the past year—the elimination of the higher code speed tests for the General and Extra license classes. Unfortunately, this rule change was not without the hue and cry from some who earned their tickets the old-fashioned way. "I got mine the hard way, so why is the FCC making it easier for everyone else?" was heard lots on and off the air. There were several reasons, the two major ones being the almost elimination of the need to know the code on the world scene and the pressure from those who wanted to have the code test eliminated altogether.

So here we are in this point in time in the history of our hobby. We have a code test to upgrade to General and/or Extra. It's not hard, but for some it's still formidable. What is the easiest way to pass the test? I will answer that question by process of elimination. The way I passed my test is the hardest. Even with a typewriter, copying the code one character at a time is the worst. It inhibits your speed.

I mentioned a moment ago that to me, the code is a foreign language. As such, it must be learned like a foreign language. Learning associations of letters together to form words is how one learns a language. It is my contention that it is no different with the Morse code. For example, if you learn the code one letter at a time, you will find yourself copying one letter at a time. If you hear the tones "dah dit dah dit (space) dit dah (space) dah, you put those letters together and read that you have spelled the word "cat." Yet if you learn the code as a language, you come to associate those dits and dahs as parts of the total sound of the word "cat" in just the same way as you would associate the sound of saying the word "gato" as the Spanish equivalent to the English word "cat." Therefore, this is my first recommendation for the easiest way to learn the code: Learn it as if you were learning a new language.

Once you have mastered the code (in some way or another), you will be ready to take the test. Above I mentioned that the way I took the test is the absolute worst way. Thankfully, it is not the only way that it is administered. For most exam sessions you are given the option to either copy the code or take a test on the contents of the message sent. If you are the least bit unsure of your ability to copy the text for a solid minute, you will want to take a written exam on the text rather than trying to copy it letter by letter.

Here is another insight: If you have access to a multiple-choice exam based on the message sent, go for the multiple-choice exam over a fill-in-the-blank type, because while you examine the answers, you can review the sounds associated with the answers. You are more likely to recall bits and pieces of a word that will cue you into selecting the right answer—especially when you are looking at it as one of the multiple choices.

If you have no other option but to take a fill-in-the-blank type of test, then by all means copy as much of the code on paper as you can. Who knows? You just might surprise yourself and pass outright! This happened to one man working on his 13 wpm test. The VE examiners at a testing session knew he had the ability to copy but had severe test anxiety, which kept him from passing the test. This time at the VE session a group of VE examiners created an environment whereby this man thought he was taking a warm-up test for practice just to get his nerve up. Unknown to him, three VE examiners watched as he made a nearly perfect copy of five minutes at 13 wpm. They took his test from him, graded it, and announced that he had just passed his General code test!

Even if you don't pass the test via a direct copy of the message sent, you will be given an opportunity to take a written exam, and you will be able to use your copy to help you fill in the blanks. This

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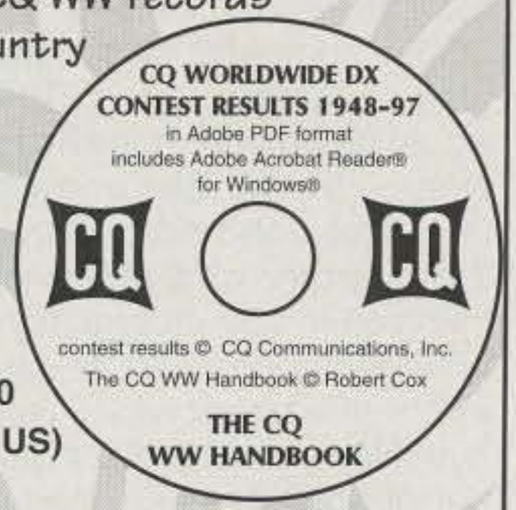

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using of one's copy coupled with being good at the *Wheel of Fortune* TV game show is what enabled a friend of mine to pass her 5 wpm test several years ago. Going into the test her code speed was barely above 1 wpm. Nevertheless, she passed. One example of her creativity in passing the test was carefully looking over her copy to see if there was any clue to an answer. For example, one question was "What is the transmitting station's antenna?" From her studying for the theory exam she knew the potential choices to be a beam, a quad, a dipole, or a vertical, all pretty common antenna types. When she saw a Q and a D in close proximity to each other, she guessed "quad," which was the correct answer.

I have written about my journey to successfully passing my code test, plus I have given you a couple of examples of others who also passed theirs via some ingenuity and creativity. On your way to taking the easiest code test, let's review my hints. First, learn the code like a language. Second, opt for a multiple-choice type exam on the message sent. Third, if you must go for a fill-in-the-blank type of exam, then do your best at copying the text before taking the written exam.

There you have it—a few hints on how to take the code test. I hope you pass your test with flying colors! I know that when you do, you will want to try out your new privileges on HF after you have completed your upgrade, and that's fine. However, remember that you will always have a home on the VHF-plus ham bands and you will be welcomed back any time you want to return.

South Dakota Proposes Ban on Mobile Operations

According to the State of South Dakota, legislation has been proposed that would prohibit the use of certain hand-held devices by motor-vehicle drivers. These devices would include a cellular telephone, computer, facsimile, or other portable or laptop device. The exemptions would be an operator who is operating an emergency vehicle, one who has gotten off the road and is at a complete stop, and the operator of a motor vehicle who is involved in any emergency, observes an emergency situation, or observes the operator of another motor vehicle driving in a reckless, negligent, or dangerous manner or apparently driving under the influence of alcohol or drugs, and the use of that device is necessary to report the emergency or observation to appropriate authorities. Furthermore, any passenger would be exempt from this law. For more information on this proposed legislation, look it up at <http://legis.state.sd.us/sessions/2001/bills/SB207p.htm>.

This legislation deserves to be defeated, yet even if it is passed, I believe that it is almost unenforceable—except at the scene of an accident. If the investigating police officer discovers that the driver of a vehicle who was involved in an accident was using one of the banned devices, and the officer knows about this ban, then the officer may issue a citation for violating this law. However, because violating this law will be considered a petty offense (a misdemeanor), it is highly unlikely that any police officer would be asked to go out and find drivers who are violating this law.

While I am opposed to this legislation, I am concerned about the use of electronic equipment while driving. It is my contention that the use of any equipment while driving is not without risk. Two years ago I covered a critical report that first appeared in the *New England Journal of Medicine* and later was featured in an article in *The Readers Digest* concerning the dangers associated with cell-phone use while driving. The *NEJM* article cited research that indicated persons using cell phones while driving were four times more likely to be involved in an automobile accident.

Because this subject deserves another look, I will cover it in more depth next month. I will speak to it from a cognitive psychologist's angle to see what we are doing while we are hamming and operating a motor vehicle and how we might be a bit more safe while operating.

Current Meteor Showers

This month's meteor showers are the following: The *Lyrids* meteor shower will be active between 19–25 April. It is predicted to peak around 0400 UTC on 22 April. This is a north-south shower, producing at its peak around 10–15 meteors per hour, with the possibility of upwards of 90 per hour. A minor shower and its predicted peaks is *pi-Puppids* (peak around 1500 UTC on 23 April). This information courtesy the International Meteor Organization and their home page at <http://www.imo.net/calendar/cal01.html#April>.

Current Contests

Spring Sprints: The East Tennessee DX Association will again be sponsoring the Spring Sprints. The following are the dates and times of the various contests:

- 144 MHz Sprint, 7 PM to 11 PM local time, Monday, April 9
- 222 MHz Sprint, 7 PM to 11 PM local time, Tuesday, April 17
- 432 MHz Sprint, 7 PM to 11 PM local time, Wednesda, April 25
- Microwave Sprint, 6 AM to 1 PM local time, Saturday, May 5. This includes all amateur frequencies above 903 MHz. Include band data in summaries and logs. *Note:* Use of the Liaison Frequency is encouraged.
- 50 MHz Sprint, 2300 UTC Saturday to 0300 UTC Sunday, May 12–13

Logs may be e-mailed to: <vhfdx@etdxa.org>. Paper logs go to: ETDXA/NJ4I, 1620 Hidden Hills Drive, Clinton, TN 37716. Complete rules can be found at <www.etdxa.org>.

Six Club Sprint: The Six Club announced that they will hold their first Sprint on April 28, for five hours beginning at 2300 UTC. The following are their contest rules: "Each QSO is worth one point in his/her own country and two points for every contact made outside of his/her country. Hawaii and Alaska are considered a separate country. Multiply total QSO points by the total number of grids worked. Send logs to: Six Club, P.O. Box 307, Hatfield, Arkansas 71945. All entries must be received by May 27, 2001, either by e-mail or snail mail. The sprint contest times may vary in your location. For stations outside of North America, you may run the sprint contest in the evening hours starting at the scheduled date of the sprint. Awards will be given out to first-, second-, and third-place winners in each country. For information visit <http://6mt.com/contest.htm>.

Current Conference

The Southeastern VHF Society will host its Fifth Annual Conference April 20–21 at the Holiday Inn Select-Brentwood, in Nashville, Tennessee. The program will include presentations by antenna specialist L. B. Cebik, W4RNL; EME enthusiast Bob McGraw, K4TAX; and many other VHF+ operators. In addition to the technical program/presentations and conference proceedings, there will be pre-amp noise-figure testing (50–1296 MHz), anenna gain measurements (144–2304 MHz), family program, fleamarket, vendor sales displays, SVHFS auction, annual business meeting, Saturday night banquet with guest speaker, K4UHF award presentation, and many door prizes. Pre-register for the conference by completing the registration form on the SVHFS web site at <www.svhfs.org>. To be added to the SVHFS mailing list contact Robin Midgett, KB4IDC, via e-mail at <KB4IDC@arrl.net>. SVHFS mailing address is SVHFS Inc., P.O. Box 1255, Cornelia, GA 30531.

Henry Hope, N3VBG, SK

According to Rick Tarbert, Henry Hope, N3VBG (FM19), became a silent key in mid-February. Rick shares the following, "Henry lost his life as a result of complications related to his heart surgery. He was very active on 6 meters and somewhat on 2 meters. He was a beacon for many on 6 when things where happening or about to happen. He was also a good friend. He is and will be missed."

Commenting on Henry, Oscar Morales, CO2OJ, wrote, "Henry will be missed for

sure. I knew him through the 6 meter band for years and we worked almost every VHF contest. On every opening from Cuba to the US eastern coast I heard his unmistakable voice calling me. During a *Perseids* shower I worked him also on 2 meters and that was really great. Please pass my condolences to family and friends."

Samuel, KD4ESV, wrote, "I will miss Henry very much. He was a real nice guy. There are too few individuals like him in the world."

Del, K1UHF, wrote, "I am sorry to hear that Henry is gone. I talked to him for years on 2 meters SSB and I always enjoyed hearing him on. He will be missed."

Don, NL7CO, wrote, "I personally remember that Henry was always willing to ragchew if that's what you wanted to do, or just as willing to let you work him and pursue others in a contest-type QSO. I will miss my friend that I only knew through this hobby. I also hope that someone local to his family is collecting some of these comments to let them know how must he touched so many lives."

John Fridenstine, W8PAT, wrote, "Many years ago when a ham friend of mine passed on, I put his QSL on the wall in a place of honor and respect. I have done the same with others over the years. Regrettably, that special place has become crowded in recent years. Rationally I accept this, but I sure don't like it."

Bob Cumming, W2BZY, wrote, "God speed Henry. FM19 won't sound the same without you and God be with your family in this hour of need."

And Finally . . .

John Fridenstine, W8PAT, has an excellent idea that he shared in the above quoted tributes to Henry Hope. Unfortunately, many of us know more and more of our ham radio friends who have become silent keys over years. What better way to remember our friends than to post their QSL cards in a place in our shack.

Another way of remembering our friends is to recall the nice things about them as those I quoted above remembered regarding Henry. When we remember these things about our friends, then a way of honoring that memory is by taking it a step further and think of those things as mentoring thoughts for us to emulate. If we all worked in that direction, one step at a time, our hobby would see significant and wonderful improvements.

As you can see from having read this column, there are a lot of opportunities for VHF-plus activities this month, both in contests and meteor showers. So get out and take advantage of them. When you do, and you have something to brag about, please let me hear from you so that I can brag about you in this, your column.

Until next month...

73, Joe, N6CL

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On the Cover

If you want to find out Steve Kelly, K7EM's favorite bands, all you have to do is look up at the antennas outside his station in Beavercreek, Oregon, about 20 miles outside of Portland. Let's see ... First there's the full-size 80 meter four-square ... Then, over on the 165 foot tower, there's a side-mounted 6-element beam for 15 meters, and another for 10 ... and oh, yes, two stacked full-size, 3-element 40 meter Yagis on ring rotors. Finally, on the "small" tower, the 72 foot motorized crankup, there's a 5-element monobander for 20 and a 2-element "shortie" on 40. If you're still not sure, try this: Steve's FT-1000D can be routed either to his big Henry amplifier, used only for 80 and 40 meters, or to his smaller Ameritron amp, which he uses on the higher HF bands and with the "shortie on 40."

Still unsure of his favorite bands? Try this: Steve holds the 7th call area record in the CQ World-Wide DX Contest for 40 meter SSB. Oh, did we mention that 40 meters is Steve's favorite band, followed closely by 80?

Steve was licensed in 1978 at age 14 and was quickly introduced to contesting through the now-defunct Novice Roundup. After a few years of pursuing other interests, Steve returned to contesting in the mid-1980s, focusing on 80 meters, then started contesting on 40 "kind of for the fun of it" and has been doing "some fairly serious competing" on the band for the past decade.

Since our cover photo shows the inside of Steve's shack, he says you can see some photos of his antennas (along with freshwater aquariums, his other hobby interest) on his website at <http://www.bctonline.com/users/skelly>. (Cover photo by Larry Mulvehill, WB2ZPI)

New From LDG Electronics
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The RT-11 is a compact tuner mounted in a water resistant ABS plastic enclosure. The Autotuner was designed with remote mounting in mind, including mobile, marine, tower, or any application requiring a remote mount. The RT-11 tunes most coax fed antennas such as dipoles, beams, and verticals. The RT-11 will operate with power and control signals supplied by Icom and Alinco radios via an optional cable. The new RT-11 design also expands the tuner to cover 6 meters.

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DX

BY CARL SMITH, N4AA

News Of Communication Around The World

For the Future of Our Hobby

February turned out to be a great month for DXers. There were DXpeditions to a number of much needed, if not *most* needed, entities. The group at YK9A was doing a good job of handing out QSOs on all bands, especially the low bands, as this was being written. In addition, we are looking forward to major DXpeditions starting with D68C, Comoros by the Five Star Group; PWØS from St. Peter & St. Paul Rocks; T32RD from East Kiribati; FO/M from Marquesas; CEØZT from San Ambrosio Island (San Felix); and 3D2 from Conway Reef. And we thought the year 2000 was great for DXing. The year 2001 has barely started and it's been great already!

With all of these DXpeditions active at the same time, the organizers took action to spread out on the bands so they would not interfere with each other. I commend them for their attention to this potential problem.

Another problem, beyond the control of the DXpedition organizers, is the continued and growing problem of "Radio Rage." This interesting term showed up in the "ARRL Letter" recently in a report on comments by Riley Hollingsworth of the FCC Enforcement group *(see "Ham Radio News," March* CQ, *p. 4—ed.).* Hollingsworth is reported as saying, "Radio Rage could become a bigger danger to the future of amateur radio than rule breaking. It's the infighting, arguments, and juvenile spats that are going to come back to haunt us if we don't just grow up. It will do the service in, if the ham community doesn't put a stop to it." He further said, "While Radio Rage is technically not illegal, it reflects poorly on amateur radio and can balloon into an enforcement issue. Rude or intemperate on-air behavior might prove just the sort of ammunition that an entity seeking additional spectrum will use against amateur radio." Hollingsworth added, "Radio Rage in the form of such things as on-air squabbles or frequency fights can degrade the bands just as quickly as outright rule breaking. The FCC can't do anything about that. It's up to the amateur community."

Hollingsworth didn't mention DX frequencies specifically in his comments, but the implication is clearly there. It is up to *us,* ladies and gentlemen, to clean up our act before the FCC has to become involved. With another World Radio Conference coming up in 2003 (WRC-2003),and 40 meters is going to be on the agenda, it would be in our own best interest to begin taking action to end the Radio Rage on the frequencies we all enjoy—well, at least we would like to enjoy them, without the *trash.*

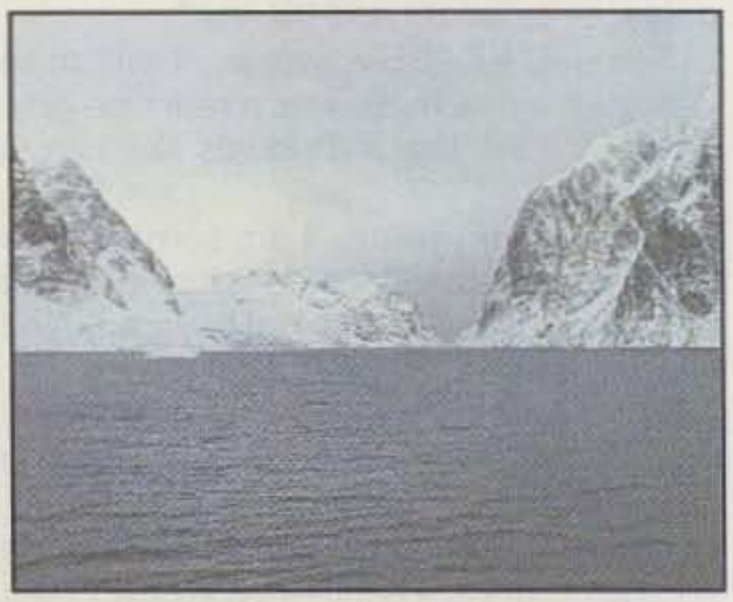
All of the intentional interference to DXpeditions, the arguing and profanity between stations on the DX frequencies, and the ever-present Frequency Cops contribute to Radio Rage. These people represent only a small number, but they make enough *noise* to greatly lessen the enjoyment the rest of us try to gain from our pursuit of DX. Some of us know who these people are, and the amateur community has, in the past, been famous for its self-policing efforts. It's time we got back into that mode of self-policing and exerted our collective force to stop this nonsense, before "big brother" has to step in and do it for us.

DX operators are listening, and acting, when they hear this bad behavior. Listen to what Jack Haden, VK2GJH, had to say after his recent operation from C21JH. Jack said, " I endured some rather disgusting behavior from the USA pile-ups on 20 meters. Couldn't believe how low the hobby has become. Four letter words, cussing each other, calling out of turn, not repeating the signal reports. I just hit the button labeled "OFF" and walked away." He added, "During two openings to NA on 14195, people were hurling four letters, self-appointed policemen screaming, people relaying signal reports, etc. The conduct I endured was disheartening."

Is this what we want to see in the future? The DX station hears this "stuff" and just turns off the radio and goes to the beach or sightseeing? Why would anyone want to spend good money to go to some needed entity and be subjected to this type of abuse? Would you?

If you know who the offenders are, tell them to stop. Don't add to the problem by joining in their verbal diatribe, but let them know—off the air— that you don't appreciate their actions. All of this *trash* only causes us DXers more difficulty, since we can't hear the DX station and we end up sitting back listening as these people get all of the attention. Is this what you would like to "show off" to the newcomers who come to your shack to see what DXing is all about? I don't think it is. We talk about the lack of young people getting into amateur radio and DXing. Is this Radio Rage going to inspire any potential new ham/DXer to join us? I doubt it.

Come on, now. Let's have some self-policing of the amateur bands—for the future of our hobby.



Entry to Vernadsky Base Antarctica.

Vernadsky Base, Antarctica.

2001 Dayton DX Dinner

The Southwest Ohio DX Association is pleased to announce the Sixteenth Annual DX Dinner to be held on Friday, May 18, 2001 at the Crowne Plaza Hotel, Dayton, Ohio, in conjunction with the Dayton Hamvention®. There will be a cash bar at 6:30 PM and dinner at 7:15 PM. Tickets are $32 and must be purchased in advance. Groups wishing to sit together must order as a group. A table seats eight. Make your check or money order payable to SWODXA and send an SASE for ticket return. Seats

P.O. Box DX, Leicester, NC 28748-0249
e-mail: <n4aa@cq-amateur-radio.com>

The WAZ Program

Single Band WAZ

10 Meter SSB

513 ..... W6UPI

160 Meters

144 ..... NØTB endorsement – 37 zones
161 ..... 5B4ADA endorsements –39 and 40 zones
162 ..... RAØFA – 31 zones
44 ..... F6BKI endorsements – 38, 39, and 40 zones

All Band WAZ

SSB

4618 ..... W3HGT
4619 ..... KØGY
4620 ..... DF2FZ
4621 ..... HL3GOB
4622 ..... JA1BUQ

Mixed

8002 ..... W9RPM
8003 ..... K6UNE
8004 ..... N7SEJ
8005 ..... KP4BME
8006 ..... N2BT
8007 ..... KØGY
8008 ..... JA1EUT
8009 ..... UA6LP
8010 ..... JA2PVE
8011 ..... PA4WM

All CW

223 ..... SP3ESV
224 ..... RAØFA
225 ..... E4/G3WQU
226 ..... DS5RNM

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, Paul Blumhardt, K5RT, 2805 Toler Road, Rowlett, TX 75089. The processing fee for all *CQ* awards is $6.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $12.00 for nonsubscribers. Please make all checks payable to Paul Blumhardt. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. K5RT may also be reached via e-mail: <k5rt@cq-amateur-radio.com>.

Pavel ,UT1KY, at the EM1KY station.

will be assigned in the order that requests are received. Seats were to be assigned on March 11. Seating is limited. Please order tickets from Steve Bolia, N8BJQ, 7354 Thackery Road, Springfield, OH 45502. For more information, go to <http://members.aol.com/SteveB4622/> or contact Steve at 937-788-2803, e-mail <n8bjq@erinet.com>.

W4DR the Clinton B. DeSoto Cup 2000 Winner

Bob Eshleman, W4DR, of Midlothian, Virginia is the winner of the Clinton B. DeSoto Cup for 2000. The DeSoto Cup, a new ARRL award being presented for the first time, recognizes the station that's on top of the DXCC Challenge List as of September 30 each year. The

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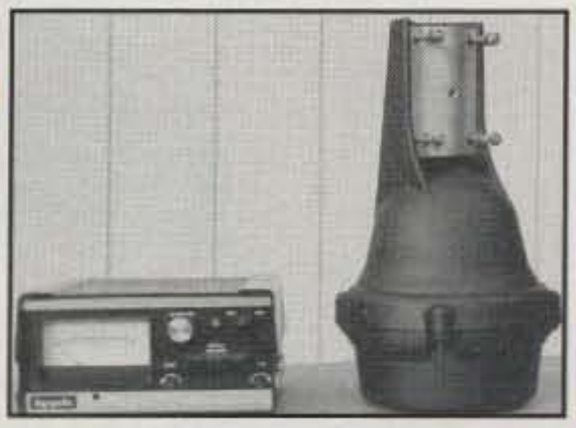

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The WPX Program

SSB

2774 ..... WA2RF 2781 ..... K3IRV
2779 ..... F5SOF 2782 ..... GM4ELV
2780 ..... 9A1CZZ

Mixed

1874 ..... W4GP 1875 ..... 9A1CZZ

CW

3056 ..... K3JHT 3058 ..... JN7LYD
3057 ..... JM3LWR 3059 ..... JR7HAN

CW: 350 K3JHT. 400 JM3LWR, JR7HAN. 750 KX1A. 1050 GM4ELV. 1600 W9IL. 2300 PAØSNG. 4150 N6JV..

SSB: 450 JR1DHD. 500 IK8OZP. 550 F5SOF. 800 UA1ZKF. 1800 W9IL. 2500 KF7RU.

MIXED: 550 N3TA. 1000 W4GP. 1200 KX1A. 2550 W9IL. 3250 IK2ILH. 3500 WB2YQH. 3950 F6DZU. 4450 W1CU. 4550 F2YT.

10, 15, 20, 40, 80, 160 meters: W4GP
40 meters: KX1A

Asia: W4GP, JM3LWR, JR1DHD.
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Europe: N4GP
Oceania: W4GP, KX1A

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160 Meter Endorsement: K6JG, N4MM, W4CRW, K5UR, VE3XN, DL3RK, OK1MP, N4NO, W4BQY, W4VQ, KF2O, W8CNL, W1JR, W5UR, W8RSW, W8ILC, G4BUE, LU3YL/W4, NN4Q, VE7WJ, VE7IG, W9NUF N4NX, SMØDJZ, DK3AD, W3ARK, LA7JO, SM0AJU, N5TV, W6OUL, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, UR1QD, AB9O, FM5WD, SM6CST, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, K7LJ, SM3EVR, UP1BZZ, K2POF, IT9TQH, N8JV, ONL-4003, W5AWT, KBØG, F6BVB, YU7SF, DF1SD, K7CU, I1POR, YBØTK, K9QFR, W4UW, NXØI, WB4RUA, I1EEW ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, YU1AB, IK4GME, WX3N, WBØDD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, K9XR, JAØSU, I5ZJK, I2EOW, KS4S, KA5CLV, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, S53EO, S57J, DL1EY, KØDEQ, DJ1YH, OE6CLE, HB9BIN, N1KC, SM5DAC, S51U, RAØFU, UAØFZ, CT4NH, W1CU, EA7TV, LY3BA, RW9SG, K1NU, W1TE, UA3AP.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if airmail desired) to "CQ WPX Awards," P.O. Box 593, Clovis, NM 88101 USA.

5 Band WAZ

As of December 30, 2000, 547 stations have attained the 200 zone level and 1179 stations have attained the 150 zone level.

New recipients of 5 Band WAZ with all 200 zones confirmed:
DS5RNM

The top contenders for 5 Band WAZ (zones needed, 80 meters):

N4WW, 199 (26)
W4LI, 199 (26)
K7UR, 199 (34)
WØPGI, 199 (26)
W2YY, 199 (26)
VE7AHA, 199 (34)
IK8BQE, 199 (31)
JA2IVK, 199 (34 on 40m)
ABØP, 199 (23)
KL7Y, 199 (34)
NN7X, 199 (34)
OE6MKG, 199 (31)
IK1AOD, 199 (1)
DF3CB, 199 (1)
F6CPO, 199 (1)
W3UR, 199 (23)
KC7V, 199 (34)
GM3YOR, 199 (31)
VO1FB, 199 (19)
KZ4V, 199 (26)
W6DN, 199 (17)
W6SR, 199 (37)
W3NO, 199 (26)
K4UTE, 199 (18)
K4PI, 199 (23)
HB9DDZ, 199 (31)
HB9BGV, 199 (31)
N3UN, 199 (18)
K4IQJ, 199 (23)
K3NW, 199 (23)
OH2VZ, 199 (31)
K2UU, 199 (26)
W1FZ, 199 (26)
UT4UZ, 199 (6)
SM7BIP, 199 (31)
N3UN, 199 (18)
EA5BCX, 198 (27,39)
G3KDB, 198 (1,12)
KG9N, 198 (18,22)
KØSR, 198 (22,23)
UA4PO, 198 (1,2)
JA1DM, 198 (2,40)
9A5I, 198 (1,16)
K4ZW, 198 (18,23)
LA7FD, 198 (3,4)
K5PC, 198 (18,23)
VE3XO, 198 (23,23 on40)
K4CN, 198 (23,26)
KF2O, 198 (24,26)
W6BCQ, 198 (37,34on40)
G3KMQ, 198 (1, 27)
W5BOS, 198 (18,23)
N2QT, 198 (23,24)
OK1DWC, 198 (6,31)

The following have qualified for the basic 5 Band WAZ Award:

DL3NM (183 zones)
IØDJV (190 zones)
SM4AZQ (190 zones)

Endorsements:
N2NL (190 zones)
UA3AP (200 zones)
EA6BE (200 zones)

****Please note: Cost of the 5 Band WAZ Plaque is $80 ($100 if airmail shipping is requested).**

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, Paul Blumhardt, K5RT, 2805 Toler Road, Rowlett, TX 75089. The processing fee for the 5BWAZ award is $10.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $15.00 for nonsubscribers. An endorsement fee of $2.00 for subscribers and $5.00 for nonsubscribers is charged for each additional 10 zones confirmed. Please make all checks payable to Paul Blumhardt. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. K5RT may also be reached at e-mail: <k5rt@cq-amateur-radio.com>.

"Wordie House," ex-Faraday Base Station VP8 (now Vernadsky Ukrainian Base).

award will be presented by John Kanode, N4MM, ARRL Vice President, in May at Dayton's DX Dinner mentioned above. Congratulations, Bob.

DXpedition Videos

Most of you have seen at least one of the videos showing the various DXpeditions over the years. Recently, I had the pleasure of reviewing a couple of new ones.

A52A – Bhutan. James Brooks, 9V1YC, really outdid himself with this one. Then again, he had great material to work with—the A52A DXpedition and the fantastic country of Bhutan. The video runs one hour and not only shows the radio operation, but spends a lot of time on the local people and scenery of Bhutan. Even my wife and her sister (non-hams) watched with fascination as James provided outstanding commentary on the beautiful country and the people of Bhutan. I can highly recommend this one for your collection. It is available for $15 plus $5 shipping per copy as follows:

North America: Charlie Hansen, NØTT, 8655 Highway D, Napoleon, MO 64074.

Europe: Declan Craig, EI6FR, 167 St. James Road, Greenhills, Dublin 12, Ireland.

Asia-Pacific/World: James Brooks, 9V1YC, 70A Duxton Road, Singapore 089529, Singapore.

Copies of this video will be available at the Dayton Hamvention® in May. Further details will be available in April at my e-mail address shown at the beginning of this column.

3V8BT – Kerkennah Island (IOTA AF-073). Sergio, I5NSR, has prepared a very good video of this IOTA operation in North Africa. It contains excellent scenery with a lot on the local people, as well as the radio operation. I don't have details on the cost, but you can contact Sergio at his e-mail address, <nsr@texnet.it>, for that information.

QSL Direct. *(This information is from NE8Z.)* "I love to hunt Antarctic stations. Over the last year I have struck up a

THE WPX HONOR ROLL

The WPX Honor Roll is based on the current confirmed prefixes which are submitted by separate application in strict conformance with the CQ Master Prefix list. Scores are based on the current prefix total, regardless of an operator's all-time count. Honor Roll must be updated annually by addition to, or confirmation of, present total. If no up-date, files will be made inactive.

MIXED

4922 9A2AA	3652 VE3XN	3118 W9HA	2945 I2EOW	2773 W2ME	2281 9A4W	1939 PY2DBU	1613 YU1ZD	1337 VE6BMX
4302 W2FXA	3624 9A2NA	3091 WA8YTM	2903 KF2O	2743 HAØIT	2256 K5UR	1916 DJ1YH	1572 VE6BF	1165 KX1A
4034 W1CU	3606 N4MM	3029 YU7BCD	2849 4N7ZZ	2597 HA5NK	2252 W8UMR	1877 OZ1ACB	1443 KØKG	1147 W2CF
4030 F2YT	3513 I2PJA	3027 YU7SF	2835 W2WC	2469 YU7GMN	2170 W4UW	1842 I2EAY	1429 W2EZ	1082 OK1DWC
3997 K6JG	3458 YU1AB	3026 K9BG	2831 IT9QDS	2455 N6JM	2093 W7OM	1745 AA1KS	1418 WT3W	1040 PY1NEW
3960 EA2IA	3439 SM3EVR	3010 WB2YQH	2800 JH8BOE	2424 W9IL	2028 WB3DNA	1670 W7CB	1408 NG9L	1020 KU6J
3772 UA3FT	3333 N5JR	2974 I2MQP	2798 IK2ILH	2372 S58MU	2019 HA9PP	1651 I1-21171	1379 N1KC	1006 VE9FX
3762 N6JV	3144 PAØSNG	2970 S53EO	2787 KØDEQ	2314 W6OUL	2012 JN3SAC	1642 Z35M	1343 VE6FR	937 N3KR
3736 N4NO								

SSB

4306 IØZV	2968 EA8AKN	2500 4X6DK	1975 K5UR	1655 K5IID	1548 K8MDU	1385 I3UBL	1064 NH6T	783 VE6BMX
3845 ZL3NS	2909 N4NO	2488 I8KCI	1972 W4UW	1643 W6OUL	1525 IKØEIM	1318 N2SS	1041 N1KC	781 N3DRO
3701 K6JG	2888 K4CSP	2412 WA8YTM	1860 N6FX	1631 HA5NK	1514 W2ME	1273 NG9L	1005 DL8AAV	717 F5RRS
3547 F6DZU	2877 9A2NA	2404 KF7RU	1769 K2XF	1631 K3IXD	1493 IK2AEQ	1179 KI7AO	978 EA3EQT	716 KX1A
3503 I2PJA	2758 PAØSNG	2381 YU7BCD	1767 LU5DV	1626 W7OM	1483 DF7HX	1154 WT3W	972 AI6Z	699 KU6J
3172 CT4NH	2739 I2MQP	2325 EA1JG	1748 YU7SF	1617 I3ZSX	1444 SV3AQR	1153 K4CN	932 LU4DA	679 OK1DWC
3168 N4MM	2706 I2EOW	2305 CX6BZ	1717 W9IL	1599 DK5WQ	1427 N3XX	1141 IKØJMS	890 AG4W	652 F5LIW
3056 EA2IA	2672 CT1AHU	2134 IN3QCI	1707 I8LEL	1591 IT9SVJ	1421 W2FKF	1099 EA5DCL	877 JN3SAC	634 F5UTE
3019 OZ5EV	2515 LU8ESU	2038 OE2EGL	1698 EA7TV	1568 CT1BWW	1410 T30JH	1064 I2EAY	855 VE9FX	605 KE4SCY
3019 F2VX	2515 EA5AT	2033 HAØIT	1667 KS4S					

CW

4045 WA2HZR	3021 YU7LS	2437 YU7BCD	2016 N6FX	1779 IT9VDQ	1546 W7OM	1268 4X6DK	1060 W4UW	787 WA2VQV
3734 N6JV	3005 EA2IA	2396 WA8YTM	1996 G4SSH	1762 W6OUL	1488 VE6BF	1257 EA2CIN	935 VE6BMX	750 KX1A
3365 VE7CNE	2699 LZ1XL	2288 W2WC	1946 I7PXV	1706 JN3SAC	1466 IK2ECP	1248 AC5K	926 PY4WS	732 AI9L
3247 K6JG	2566 9A2NA	2238 JA9CWJ	1925 OZ5UR	1672 IK3GER	1393 EA6AA	1154 LU7EAR	898 JK1AJX	691 N1KC
3149 N4NO	2534 W2ME	2159 KA7T	1866 LU2YA	1572 W9IL	1310 I2EOW	1150 DF6SW	832 WT3W	668 KU6J
3043 K9QVB	2497 N4MM	2105 G3VQO	1821 K5UR	1555 I2EAY				

friendship with Pavel (Paul, UT1KY), EM1KY, down at Vernadsky Base in the Argentine Islands (AN-006). Pavel is a veterinarian and studies the wildlife on Galindez Island. He is also the chief radio operator of the base. He returns to Kiev on February 16th for one year (via Buenos Aires and Paris).

"In early January I was sitting in the barber's chair here in Hamburg, Michigan... I asked Sheila (the barber) if she was going south for the winter, and she answered, "...actually, yes...I'm leaving for Antarctica tomorrow." Well, it blew me out of the chair! I asked her about her itinerary, and she showed me a copy. Right away I saw Vernadsky Base listed. I went home, checked the OH-

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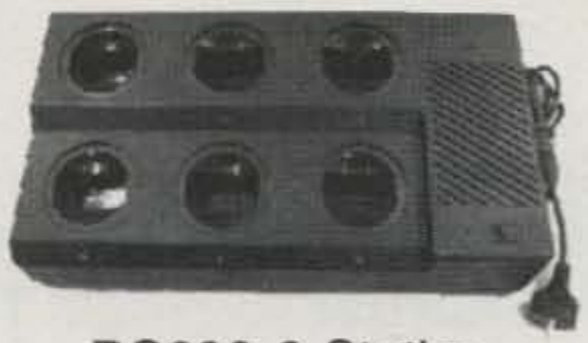

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JW5HE to LA5HE
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K1D to W1DAD
KG4AS to N4SIA
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KL1SLE to AC7DX
KL7FH to AC7DX
KL9A to AC7DX
LV2V to EA5RD
LV3VAL to EA5RD
MU/DF2SS to DL2MDZ
MW2I to WW2R
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OG3M to OH1VR
OHØMMM to OH1VR
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PJ5N to K7NAA
PJ6/PA3GIO to PA3GIO
PWØS to KU9C
R1ANM to ABØKG
S21YT to JA7KXD
S21YV to KX7YT
SI9ØØTKM to SK6NL
T2ØCK to HB9BCK
T3ØCT to DL2MDZ
T31AF to DL2MDZ
T31AF/MM to DL2MDZ
T32RD to OK1RD
T33VU to DL2MDZ
T88DX to JI3DLI
T88SM to JA6EGL
T88VO to JM6VOV
TK/DF2SS to DL2MDZ
TL8CK to F6EWM
TT8RH to F8BBT
TZ6HY to DJ9ZB
9M6CT to Philip Weaver, P.O. Box 7, Bangkok 10506, Thailand
BA4DW to David Y. J. Zhou, P.O. Box 040-088 Shanghai, 200040, P.R China (e-mail: ba4dw@qsl.net)
BV2A to T Chen, POB 30-547, Taipei, Taiwan
DL2MDZ to Rainer Kuehnberger, Hofer Str. 54, D-95233 Helmbrechts, Germany (e-mail: DL2MDZ@t-online.de)
DS4CNB to Dae Ryung Lee, Kwangsan POB 111, Kwangsan-gu Kwangju 506-050, Rep. of Korea
EP2FM to Abdollah Sadjadian (Registered mail) PO Box 16765-1187 ,Tehran, Iran (e-mail: as@neda.net)
EP3SMH to P.O. Box 17665-441, Teheran, Iran
ER1DA to Valery Metaxa, PO Box 3000, Kishinev, MD-2071, Moldova, Europe
FR5FD to Patrick Lebeaume, 40 rue Louis Desjardines, Bois de Nefles F-97411 Saint Paul, Reunion Island via France

Cluster, and found EM1KY on 14.260. I called Pavel and told him that I was going to QSL Direct and that he would have my QSL in five to six days. He mentioned that there was no regular direct mail to him on Galindez Island.

"Shiela and her boyfriend arrived there six days later. They approached Pavel and gave him my QSLs, a January 2001 issue of *QST*, and a new AES Catalog. He was thrilled! Pavel gave them a first-class tour of the entire base. He filled out two QSLs for me, one from LU1Z/EM1KY and one from EM1KY. He also sent a bag full of goodies—Antarctic lip balm, Antarctic skin lotion, Ukrainian chocolate, stones and sea shells from Galinzez Island, and

Pavel in the post office/souvenir shop at Vernadsky Base.

two pieces of handmade Antarctic art/souvenirs for the shack wall.

"So, for the record...I received my EM1KY and LU1Z/EM1KY QSLs in 20 days via 'direct' at a cost of $16,000!

"Pavel told me that his FT101ZD is going to be replaced with a new ICOM IC-706, which he saw in the AES catalog. He will return to EM1KY in one year. He also joked that the other R1A stations were envious of his reading the January 2001 *QST*—in January!

"The BBC had a film crew on the ship, and they filmed a documentary that will air on the Discovery Channel this coming summer."

I just couldn't resist reporting Rick's story. Can you imagine the look on Pavel's face when he really did get those cards in six days?

Until next month, have fun and work lots of DX. 73, Carl, N4AA

CQ DX Awards Program

SSB

2332	W7TBJ	2335	VE2ME
2333	XE2NLD	2336	WA2GVI
2334	KE4MBP		

SSB Endorsements

320	XE1L/333	320	YZ7AA/326
320	W6BCQ/333	310	WA4ZZ/315
320	VE2PJ/332	310	SV3AQR/310
320	VE4ACY/332	275	4X6DK/297
320	KX5V/331	275	KA5OER/280
320	N2VW/331	200	VE7SMP/230

CW Endorsements

320	K4IQJ/332	300	PY4WS/308

The basic award fee for subscribers to *CQ* is $6. For non-subscribers, it is $12. In order to qualify for the reduced subscriber rate, please enclose your latest *CQ* mailing label with your application. Endorsement stickers are $1.00 each plus SASE. Updates not involving the issuance of a sticker are free. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business-size, No. 10, self-addressed, stamped envelope to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. Currently we recognize 333 active countries. Please make all checks payable to the award manager.

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Contesting

BY JOHN DORR, K1AR

News/Views Of On-The-Air Competition

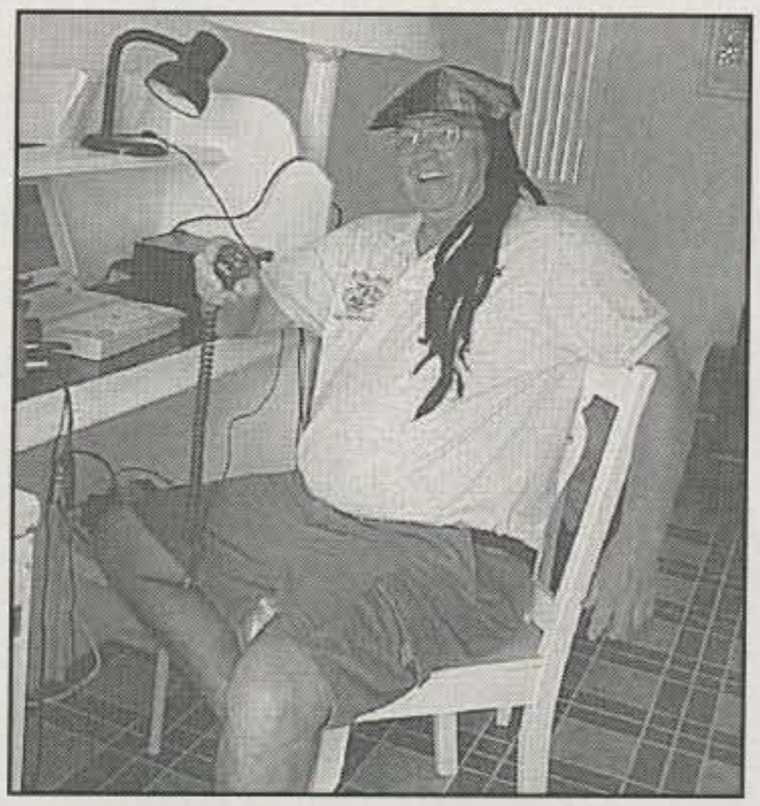
Introducing CQ's 2001 Contest Survey

April's Contest Tip of the Month

Do you measure your contest metrics? For example, are you aware of your personal bests in QSO rates/hour, number of countries/band, greatest scoring effort, etc.? As contesters with any level of experience, we should always be striving for improvement and using easily calculated metrics as tools to help us get there. Contesting by its very nature is a sport of numbers. Use that data to help you measure yourself and make higher scores!

Calendar of Events

Mar. 24-25	**CQ WW WPX SSB Contest**
Apr. 7-8	SP DX Contest
Apr. 7-8	EA RTTY Contest
Apr. 11-13	DX YL to NA YL CW Contest
Apr. 13-15	JA Int'l HF DX Contest (20–10m)
Apr. 14-15	MARAC County Hunter SSB Contest
Apr. 14-15	King of Spain Contest
Apr. 21-22	YU DX Contest
Apr. 21-22	Michigan QSO Party
Apr. 21-22	Holyland DX Contest
Apr. 21-22	Ontario QSO Party
Apr. 25-27	DX YL to NA YL SSB Contest
Apr. 28-29	Helvetia (HB) Contest
Apr. 28-29	Florida QSO Party
Apr. 28-29	Nebraska QSO Party
May 5-6	ARI Int'l DX Contest
May 5-6	MARAC County Hunter CW Contest
May 12-13	Oregon QSO Party
May 12-13	CQ-M DX Contest
May 19-20	Baltic DX Contest
May 26-27	**CQ WW WPX SSB Contest**
June 9-11	ARRL June VHF QSO Party
June 16-17	All Asian CW DX Contest
June 23-24	ARRL Field Day



In the CQ WW WPX SSB 2000 results in the February issue of CQ on page 126, we made several errors in the caption of the top photo, which we rerun here. Bill (not Don), W4WX (not K4WX), operated multi-single as V25WX (we got that right) in the contest last year.

Well, it's that time of year for another *CQ* magazine Contest Survey. When I began running these surveys over ten years ago, I was interested in using them as a vehicle to focus on timely topics concerning contesting, as well as creating a tool to help me understand what subjects you want covered in future contest columns. As participation has continued to grow with each year, I've been very pleased with the interest and effort that many of you have undertaken as part of this survey. Also, with the advent of internet tools, last year turned out to be an all-time low for use of postal services to reply, given the convenience of completing your responses "on line."

As we are now beginning to fall off the peaks of this solar cycle, there remains a lot to consider from a contesting perspective. In fact, we continue to debate issues concerning operating ethics, on-air operating competency and trends, and our use of technology in station design and improvements. No matter which of these topics interest you, there's certainly something on your mind that your peers are contemplating as well. A view into what you think is important in contesting is what influences many of these surveys and makes them so useful for driving fascinating dialog in contest circles.

This year for the first time I actually polled you for input; a survey for the survey, if you will. Many of your comments were the basis for the questions you are about to read (special thanks to N9RV, K5ZD, K4OGG, KL7RA, and others).

With this as a backdrop, let's get right to it. I encourage you to take a few minutes to voice your opinion. You'll find that in addition to being published in *CQ* magazine, I'll be making this survey available on most of the popular internet e-mail reflectors and other electronic sources. An on-line response is strongly preferred, as it makes for much easier tabulation.

With the assistance of Tom Roscoe, K8CX, your responses can be submitted this year by logging on to <http://hamgallery.com/survey/>. By the way, Tom has a very cool website, so after you've completed your survey, be sure to take a drive through his gallery of photographs and news. Of course you may still "snail mail" your replies in the conventional (Is snail mail conventional anymore?) manner to: John Dorr, K1AR, 2 Mitchell Pond Road, Windham, NH 03087-1299.

Enjoy the survey! If all goes according to plan, we'll have results right around the CQ WW DX Contest.

Contesters and DXpeditions

I may be going off the contest column page here a bit, but have you noticed the number of DXpeditions of late that are "getting it done" by being staffed mostly with contesters? At the risk of tooting our own horn a bit, I've been tremendously impressed by some of the recent operations' ability to "shovel QSOs™" (tnx W4AN) in incredible volume. For example, I was able to work D68C on ten band/modes in the first 24 hours of their operation with 100 watts and a dipole.

The boys from the U.K. run one of the most efficient operations you can imagine in DXpedition circles, beginning with their web technology and ending with a QSL card. While being sensitive to the many other well-run DX groups, they are staffed mostly by contest operators. Well done, gents!

Final Comments

Well, that's it this time. I'm looking forward to the pile-up of survey responses that's about to ensue. With only three or four months before the ice thaws in southern New Hampshire, I'm already to declare the year 2001 as the summer for K1AR's new tower. There's something about being incredibly weak in between major contesting events that may be driving me a bit in this direction. In the meantime, good contesting and see you on the bands.

73, John, K1AR

2 Mitchell Pond Road, Windham, NH 03087
e-mail: <K1AR@contesting.com>

2001 *CQ* Contest Survey

Your Callsign (optional): _____
Contesting Experience (years): _____
Age: _____

1. Is there anything about your station that you consider to be unique? If so, describe it below. Otherwise, skip to the next question.

   _____

2. How has your ability to copy CW changed over your years of contesting experience? (choose one answer)
   a) Declined
   b) Stayed the same
   c) Improved

3. What do you estimate your comfortable CW copying speed is today?

   _____

4. If you had to pick only one mode for contest operating, what would it be?
   a) SSB
   b) CW
   c) Digital

5. Over the last two years, how much money have you invested in your contest station?

   _____

6. Which of the following statements most reflecs your feelings about ethics in contestin?g (choose one answer)
   a) There is no cheating in contesting.
   b) A few people cheat, but not enough to really matter.
   c) There is enough cheating in contesting to be a serious concern worthy of further action.
   d) Cheating in contesting is so pervasive that the competition is essentially meaningless.

7. From your personal experience, have you witnessed the intentional violation of rules or regulatory guidelines in a contest operation?
   ☐ Yes ☐ No

8. Do you currently have TVI/RFI problems when operating contests?
   ☐ Yes ☐ No

9. If yes to Question #8, how has the problem changed in recent years?
   a) My TVI/RFI problems have gotten worse.
   b) My TVI/RFI problems have stayed the same.
   c) My TVI/RFI problems have improved.

10. Do you feel the penalties assessed as part of the log-checking process in contests are too extreme?
    ☐ Yes ☐ No

11. How would you rate the overall quality of contest operating compared to years past?
    a) Improving
    b) Declining
    c) No change

12. Should packet radio spotting be eliminated from contesting, regardless of operating categories?
    ☐ Yes ☐ No

13. Should 48-hour contests be shortened?
    ☐ Yes ☐ No

14. If yes to Question 13, what would be your recommended time duration for major contests?

    _____

Additional Comments (use extra paper if necessary):

_____

_____

_____

Return your survey responses to:
John Dorr, K1AR, 2001 Contest Survey, 2 Mitchell Pond Road, Windham, NH 03087 USA
or submit via the internet at: **http://hamgallery.com/survey**
Deadline: July 1, 2001

Awards

BY TED MELINOSKY, K1BV

News Of Certificate And Award Collecting

This month's featured county hunter is Kent Reinke, KL1V, USA-CA All Counties #1015. Here is how he became interested in county hunting and continued on to achieve this prestigious award.

"My name is Kent Reinke and am 39 years of age. I first became interested in ham radio while I was in the ninth grade. I was first licensed in 1976 and have held the following callsigns: WB7OGV, G5EDN, KF7S, and now KL1V. I received my present call the day the gate for Extra class vanity callsigns and was one of the first KL1 stations on the air.

"I first became interested in county hunting in 1980 while I was in the Air Force stationed in Montana. I had just gotten my feet wet in county hunting and then the Air Force transferred me to England. While I was stationed there other things took up most of my spare time. After England the Air Force sent me to the end of the Aleutian Islands for a fun-in-the-sun tour of duty on Shemya Island, and it was there I started trying to work toward USA-CA.

"After nearly ten years in the Air Force I had had enough of moving around the world and decided to make Alaska my permanent home. As soon as I got out of the service, the *Exxon Valdez* ran aground in Prince William Sound, so I got a job working for Exxon on radio systems for the spill clean-up effort. After the summer clean-up was done, I was hired by the Trans Alaska Pipeline to work on their radio systems, where I have worked for the past 11 years.

"When I first arrived in Valdez, I was in for a big surprise. The first winter here the town set a record for snowfall at sea level; that winter it snowed 567 inches. Well, when it snowed 47 feet in my first winter there I didn't know what I was in for. I had a modest station setup using a dipole and 100 watts. I soon found out that was not going to cut it for working the weaker mobiles on the east coast, so I made some major upgrades to the station I now use—a Kenwood TS-690 with an Ameritron AL-82 amp. The antenna is a 7-element tribander. With the upgrades to the station, I only had to contend with propagation, which in Alaska can be poor at the best of times. At least the northern lights entertain us.

"When I am not shoveling snow here in Valdez (Valdez averages 350 inches of snow per year) or hunting and fishing, I am on the radio either county hunting or DXing.

"I want to thank all those who helped me get USA-CA by going out of their way to give me the needed ones, and all those who helped with relays when the propagation was bad."—*73, KL1V*

65 Glebe Road, Spofford, NH 03462-4411
e-mail: <k1bv@cq-amateur-radio.com>

USA-CA Special Honor Roll:

Alan Roocroft, VK4AAR
USA-CA All Counties #1014
January 14, 2001

Kent Reinke KL1V
USA-CA All Counties #1015
January 25, 2001

In addition to county hunting, Kent, KL1V, USA-CA All Counties #1015, enjoys fishing and hunting.

USA-CA Honor Roll

500
EA6BE.....3137
AA1BQ.....3138
9A5O 3139
VK4AAR 3140
KA4NZG 3141

1000
EA6BE.....1564
AA1BQ.....1565
VK4AAR 1566

1500
AA1BQ.....1304
VK4AAR 1305

2000
AA1BQ.....1203
VK4AAR 1204

2500
VK4AAR 1128

3000
VK4AAR 1033
KL1V.....1034

The total number of counties for credit for the United States of America Counties Award is 3076. The basic award fee for subscribers is $6.00. For nonsubscribers it is $12.00. To qualify for the special subscriber rate, please send a recent CQ mailing label with your application. Initial application may be submitted in the USA-CA Record Book, which may be obtained from CQ Magazine, 25 Newbridge Road, Hicksville, NY 11801 USA for $2.50, or by a PC-printed computer listing which is in alphabetical order by state and county within the state. To be eligible for the USA-CA Award, applicants must comply with the rules of the program as set forth in the revised USA-CA Rules and Program dated June 1, 2000. A complete copy of the rules may be obtained by sending an SASE to Ted Melinosky, K1BV, 65 Glebe Road, Spofford, NH 03462-4411 USA. DX stations must include extra postage for airmail reply.

Valdez, Alaska, where KL1V resides, averages 350 inches of snow a year!

DX Awards

April brings three weekends of small contests or operating events which can be used to earn awards.

Lighthouse Event. K2JXW has been working the publicity mills for the "Spring Lites QSO Party" aimed at contacting lighthouses and lightships all over the world during the period 13–23 April 2001 starting at 2300Z on the 13th and ending 0300Z on the 23rd. Look for these very special stations on 3970, 7270, 14270, 21370 and 28370 kHz on SSB and 30 kHz above the low end of the CW sub-bands. This lighthouse ham group sponsors an award for contacting 25 different activated lighthouses or lightships.

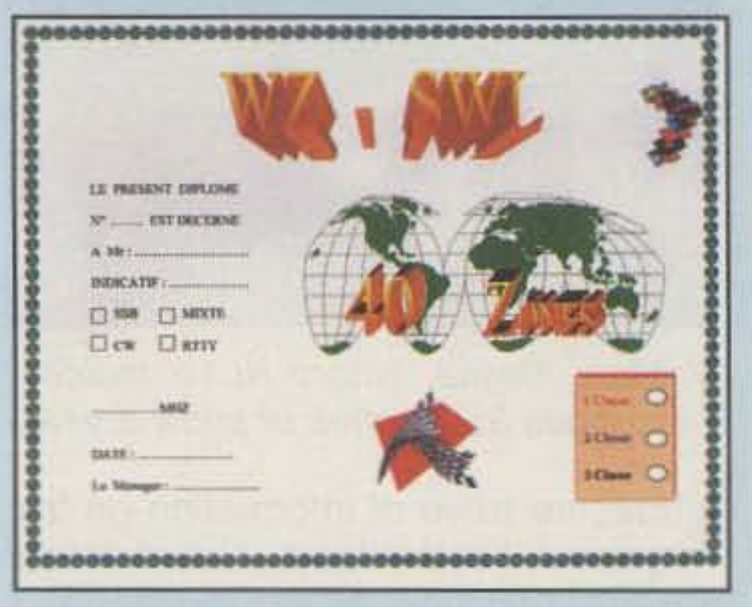
K2JXW is the webmaster for the Amateur Radio Lighthouse Society located at <http://arlhs.com/>. It's the only "Society Devoted Exclusively to Ham Radio and Lighthouses." The website is a treasure trove of information on this very specialized subject. Award details are available there as well as calendars of lighthouse-oriented events, expeditions, lists of lighthouses all over the world, and much more.

Holyland Award. The Israel Amateur Radio Club is sponsoring the "Holyland DX Contest 10th Anniversary" on the weekend of 21–22 April 2001 starting at 1800Z. This is an excellent chance to earn the contacts necessary for the award of the same name. Check out <http://hamradio.iarc.org/contests/contests.html>.

Marconi Day. Look for special-event stations operating from sites all over the world where Guglielmo Marconi (1874–1937) conducted his experiments and tests to prove the commercial capabilities of HF radio. We all are the beneficiaries of this effort. This year the event

Special-event stations will be on the air on April 21 from sites all over the world where Marconi conducted his experiments to prove the commercial capabilities of HF radio. The certificate is available for 15 contacts.

The TV-FV award is available for contacting unique French prefixes used for special events.



The Worked Zones SWL Award is issued by SWL Pierre Fournier, F-10095.

The Radio Club of Gooi, The Netherlands, offers this attractive certificate for working its members.

will be held on 21 April 2001 starting at 0000Z and ending 24 hours later. Fifteen contacts with these special stations will qualify you for a handsome certificate with a design based on a 1912 stock certificate from the Marconi Wireless Telegraph Company. The official internet site is at: <http://www.users.globalnet.co.uk/~straff/>. The Cornish Amateur Radio Club in England coordinates many of the activities.

French Awards

French SWL Pierre Fournier, F-10095, offers two special certificates. TV-FV is available to licensed stations and shortwave listeners. The Worked Zones SWL award has separate categories for licensed amateurs and SWLs. Fee for each award is $US5, 40F, 6.1Euro, or 10 IRCs. Send GCR list to TV-FV Manager, Pierre Fournier F-10095, 3 Bis, Avenue de Porche Fontaine F-78000 Versailles, France.

The TV-FV Award. Contact unique French prefixes which are used for special events such as commemorations, contests, and expeditions. Some of the eligible prefixes include: TV, FV, HW, HX, HY, TH, TM, TO, TQ, TW, and TX. French stations need cards from six different stations; all others only need three. Hand-printed endorsements are available for Phone, RTTY, CW, and single band upon request. SWL okay.

The Worked Zones SWL Award. Receive QSLs or SWL cards in the different CQ zones; there are 40 in all.

Three classes for licensed amateurs:

Class 1—receive QSLs from SWLs in all 40 zones.

Class 2—receive QSLs from SWLs in 20 zones.

Class 3—receive QSLs from SWLs in 10 zones.

Three classes for SWLs:

Class 1—receive QSL confirmations from hams in all 40 zones.

Class 2—receive QSL confirmations from hams in 30 zones.

Class 3—receive QSL confirmations from hams in 20 zones.

There is no time limit. All bands or modes are acceptable. Endorsements are available for mode or band.

The Netherlands Radio Club of Gooi Certificate

The Netherlands is composed of twelve provinces, and each province is subdivided into "Regios," or regions. You'll see this on their QSL cards. Gooi is located in the province of North Holland, just one of eight Regios in the province. The club sponsors a colorful certificate for working members.

Contact stations in region R15 on or after 1 January 1945. SWL okay. Stations from R15 need 30 points, other PA stations 15, and all others 5. Each contact with a member counts 1 point. Club station PI4RCG is worth 3 points. All bands and modes, no repeaters. The same member may be worked on different bands and modes. Send GCR list and fee of fl10 ($US5) to Radioclub 't Gooi, E.A. Kleinjan, PE1PPQ, Vaartweg 29, 1211 JD Hilversum, Netherlands.

The Appalachian Trail Award

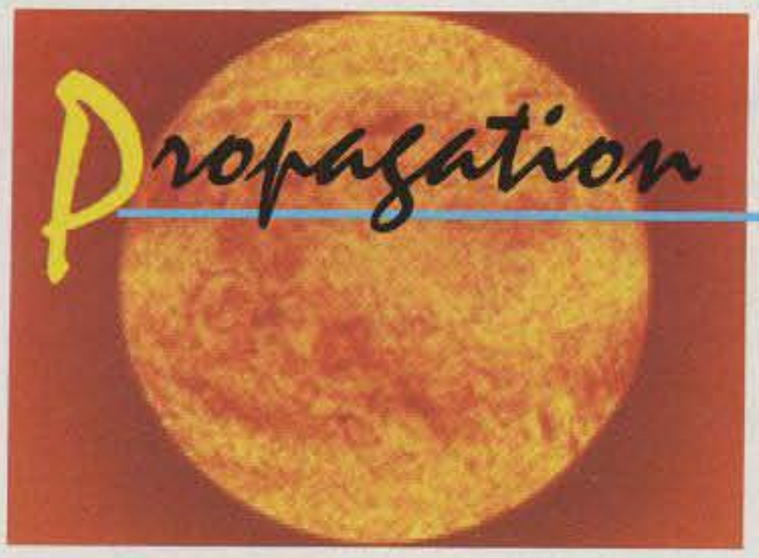
This award is one of a series of certificates and plaques offered by the Eastern Pennsylvania QRP Club for making contacts with stations on this trail or in states along its path. Visit their web page at: <http://www.n3epa.org/Pages/AT/AT.htm>.

The Appalachian Trail Award is offered for contacts with stations in 14 specific US states.

To receive this certificate you must have two-way communication with one station from each of the following 14 states: CT, GA, MA, MD, ME, NC, NH, NJ, NY, PA, TN, VA, VT, and WV. You may work the stations from your home, and the other station may be anywhere within its state's borders. You must submit a log with the calls of the station from each of the states, date, time, band, RS(T), and QTH. The fee is $US2 and the application should be addressed to: Eastern PA QRP Club N3EPA, 1155 Robeson St., 2nd floor, Reading, PA 19604-2151 USA.

Web Page of the Month

The Frankford Radio Club of Philadelphia, Pennsylvania is one of the biggest and oldest of the giant contest clubs in the US. Members have a distinctive QSL card which depicts the "Keystone" state. They offer a handsome award at no cost just for contacting members. That's not a bad strategy to get DX stations to listen for W3's during contests. To date 1364 certificates have been issued, 313 in North America and 769 to European stations. Full details are at: <http://www.frc-contest.org/wfrc.html>. 73, Ted, K1BV



Propagation

BY GEORGE JACOBS, W3ASK

The Science Of Predicting Radio Conditions

Sunspot Cycle 23 Progress

Based on daily observations of the sun made by a worldwide network of more than three dozen telescopic observatories, the Royal Observatory of Belgium, the world's official keeper of sunspot records, reports a monthly mean sunspot number of 105 for December 2000. This results in a 12-month running smoothed sunspot number of 119 centered on June 2000. This is the same value reported for the previous month, as the cycle appears to be very slowly declining from an apparent maximum of 121 recorded for April 2000.

The daily high count for the month was 153 on December 15; a low count of 58 was recorded on December 9. A smoothed sunspot number of approximately 115 is forecast for April 2001.

The Dominion Radio Astrophysical Observatory of Canada, located at Penticton, BC, reports a corresponding adjusted mean level of 10.7 cm solar flux at 168 for December 2000. This results in a smoothed value of 180 centered on June 2000. As with the smoothed sunspot count, this is the same level recorded for the previous month. A smoothed level of approximately 178 is forecast for April 2001.

There is a growing difference of opinion among the world's solar experts as to the date of Cycle 23's peak level. Those who rely on statistical theories based on sunspot counts report that the peak most likely occurred during April 2000 with a smoothed count of 121. An increasing number of experts, however, are basing solar predictions on the 10.7 cm solar flux measurements. They argue that solar flux is a directly measured solar parameter and can be more objectively measured than sunspot counts. They point out, for example, that there may be sunspots too small to be seen with even the most advanced telescopes, but the emitted solar flux of these can be measured.

According to predictions of 12-month running mean values of 10.7 cm solar flux, based upon data provided by the Dominion Astrophysical Observatory of Canada, a maximum value of 182 flux units may have occurred between August and November 2000. It will take at least another six months of monthly mean data to confirm this.

Table I is a listing of smoothed sunspot numbers observed for Cycle 23 from its beginning through June 1999, as well as predictions made by the National Geophysical Data Center (NGDC), Boulder, Colorado through 2001.

11307 Clara Street, Silver Spring, MD 20902
e-mail: <george@gjainc.com>

LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for April 2001

	Expected Signal Quality			
Propagation Index.....	**(4)**	**(3)**	**(2)**	**(1)**
Above Normal: 1, 9-10, 18-19, 28	**A**	**A**	**B**	**C**
High Normal: 2-3, 7-8, 20, 23-24, 27	**A**	**B**	**C**	**C-D**
Low Normal: 4-6, 13-14, 16-17, 22, 25-26, 29-30	**B**	**C-B**	**C-D**	**D-E**
Below Normal: 11, 15, 21	**C**	**C-D**	**D-E**	**E**
Disturbed: 12	**C-D**	**D**	**E**	**E**

Where expected signal quality is:

A—Excellent opening, exceptionally strong, steady signals greater than S9.

B—Good opening, moderately strong signals varying between S6 and S9+, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S9, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S6, with considerable fading and noise.

E—No opening expected.

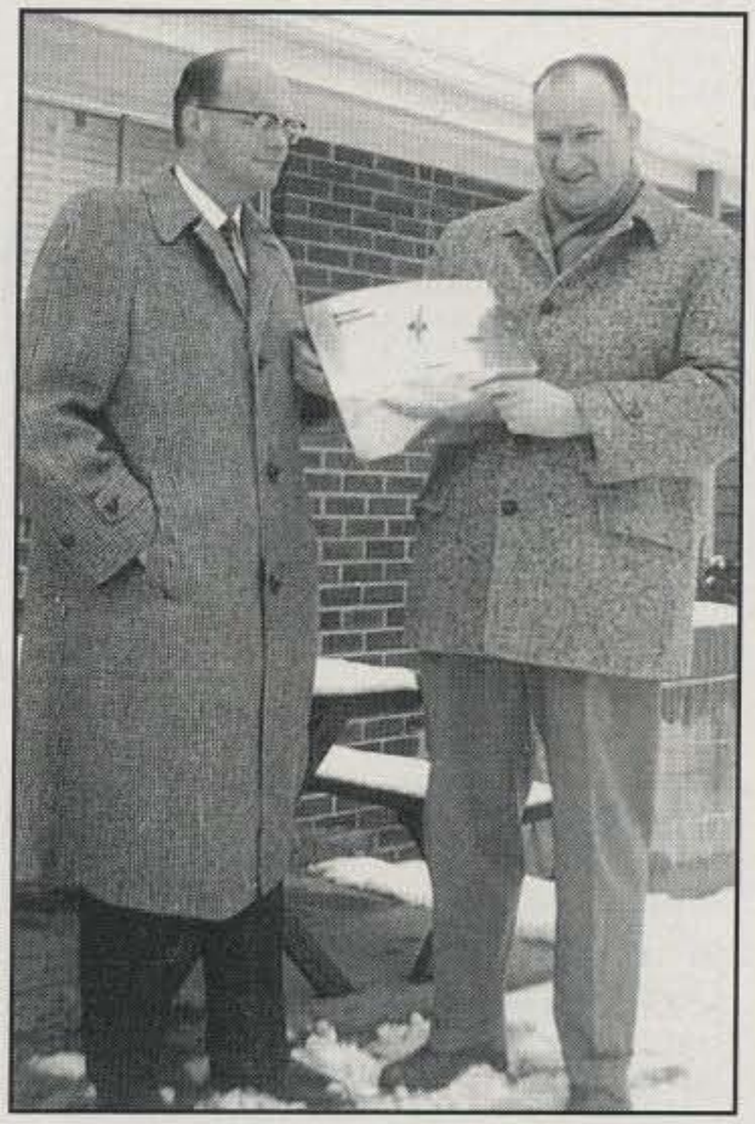
HOW TO USE THIS FORECAST

1. Find the *propagation index* associated with the particular path opening from the Propagation Charts appearing on the following pages.

2. With the *propagation index*, use the above table to find the expected signal quality associated with the path opening for any given day of the month. For example, an opening shown in the Propagation Charts with a *propagation index* of 3 will be excellent (A) on April 1st, good (B) on the 2nd and 3rd, fair-to-good (C-B) on the 4th, 5th, and 6th, etc.

Sunspot URLs

A wealth of tutorial information concerning sunspots and sunspot cycles, as well as a library of archival information dating back to the 17th century, can be found at <http://www.sunspotcycle.com>. Statistical and archival sunspot data—including daily, monthly mean, and smoothed sunspot numbers for more than two centuries—can be found at the website of the Royal Observatory of Belgium, the world's official keep of sunspot data, at <http://www.astro.oma.be> (click on "sunspot index data center"). A good source of general, tutorial, statistical, and archival sunspot, sunspot cycle, and solar flux data is also available from the National Geophysical Data Center website at <http://www.ngdc.noaa.gov>.



Bill Orr, W6SAI (left), and George Jacobs, W3ASK, holding the OSCAR-1 satellite, which they helped father, shortly before its December 1961 launch.

Bill Orr, W6SAI, Silent Key

It was with great sorrow that I learned of Bill Orr's death at the age of 81 on January 24, 2001. Bill was a peer of mine, a mentor, a radio amateur colleague, and most of all a close, dear personal friend.

An active radio amateur for 67 years, Bill's W6SAI call was well known worldwide. He contributed to the development of amateur radio over this span of years perhaps more than anyone else.

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Oops...

In our February "Moonbounce Primer" article we misidentified the Net Control of the weekend 20 meter EME net. Lionel Edwards is VE7BQH, not BHQ. Sorry for the typo and thanks from all of us for your work in helping set up EME schedules. *(Tnx K6PF)*

In the "Public Service" column in the February issue on p. 86, the relief agency volunteer pictured is Dr. Mike Marks, Medical Director of the Bush Hospital Foundation.

Also, several readers pointed out that we goofed in the chart of 40 meter band in December's "A 40 Meter DXing Primer." There is no exclusive Extra Class phone band on 40. The 7.150– 7.225 segment that we identified as such is, of course, open to both Extra and Advanced Class hams. No, it's not (as at least one reader suggested) part of a vast conspiracy to disenfranchise Advanced Class amateurs. It's just a plain old (shudder) mistake. Our apologies to all.

Smoothed Sunspot Numbers for Cycle 23

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1996	10	10	10	9	8*	9	8	8	8	9**	10	10
1997	11	11	14	17	18	20	23	25	29	32	35	39
1998	44	49	53	57	59	62	65	68	70	71	73	78
1999	83	85	84	86	91	93	94	98	102	108	111	111
2000	113	117	120	121	119	*119*	*119*	*119*	*119*	*118*	*117*	*116*
2001	*116*	*116*	*115*	*115*	*114*	*114*	*113*	*112*	*111*	*109*	*108*	*107*

Predicted values appear in italics

**May 1996 marks Cycle 23's mathematical beginning.*
*** October 1996 marks the beginning of Cycle 23 according to a consensus of scientists, which NGDC is now using.*

Table I– Smoothed sunspot numbers observed for Cycle 23 through June 2000, as well as predictions made by the National Geophysical Data Center, Boulder, Colorado, through 2001. Note that the NGDC shows the peak of Cycle 23 occurring during April 2000 with a count of 12.

Bill rose to world prominence in the DX arena as early as 1940, when he was one of the first stations to receive the prestigious WAC award. He introduced his adaptation of rotary beam antennas for radio amateur use, which rapidly became the antenna of choice for DXers around the world.

Bill's greatest contribution to amateur radio, and his legacy, however, were the more than 100 informative technical articles he authored, many of which appeared on the pages of *CQ* over a period of 50 years, together with his nine books, and 23 editions of his famous *Radio Handbook*. In a clear and authoritative manner they focus on every technical subject of interest to radio amateurs.

I first met W6SAI in Los Angeles in 1952. A personal friendship developed immediately, and over the years it grew into a family-to-family friendship. Bill and I were among that small group of "fathers" of the OSCAR satellite project, the first of which was launched during December 1961. This rocketed amateur radio into the space age!

Bill Orr, W6SAI, will be sadly missed by his family, his friends, and the worldwide amateur radio community. His key may now be silent, but his written words of wisdom will endure.—73 es SK Bill de W3ASK

April Conditions

Generally good shortwave propagation conditions can be expected during April. The effects of *equinoctial* propagation should continue through much of the month, to the advantage of DX openings between the USA and the southern hemisphere.

A seasonal decrease is expected in generally east-west DX openings on 10 meters, but this and the 12 meter band should continue to remain open to many areas of the world during daylight hours. Optimum DX during the daylight hours is expected on 15 meters, with openings possible to most areas of the world, and with 17 meter openings not far behind. Peak DX conditions are forecast for 20 meters for an hour or two after local sunrise and again during the afternoon hours. Daytime openings on 10, 12, 15, 17, and 20 meters should follow the sun. Signals should peak before noon in the quadrant extending from the northeast to the southeast. Openings toward the north and south should maximize during the afternoon hours, and signals toward the sector from the southeast to the northwest should peak during the late afternoon and sunset periods.

During the hours of darkness expect some 15 and 17 meter openings towards the south and west until as late as midnight. Twenty meters is expected to remain open to many areas of the world during the night. Thirty, 40, and 80 meters should continue to produce good DX openings from shortly after sundown, through the hours of darkness, and into the sunrise period. Some DX may also be possible on 160 meters during this same period.

As thunderstorm centers move farther towards the north during April, a seasonal increase in the atmospheric noise or static level is expected during the month. This should be most noticeable on the 30, 40, 80, and 160 meter bands, but may also be bothersome on the other bands as well.

For short-skip openings during April use the 40 and 80 meter bands during the day for distances less than 250 miles, and 80 and 160 meters at night. For distances between 250 and 750 miles, try 30 and 40 meters during the day, and 80 and 160 at night. Twenty

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meters should be optimum for daytime openings between distances of 750 and 1300 miles, with 30, 40, and 80 meters best during the period of darkness. For openings beyond 1300 miles, try 20, 17, and 15 meters during the day, with 30, 40, and 80 meters expected to be optimum at night. Some good openings may also be possible on 20 meters during the night.

The DX Propagation Charts in this month's column contain DX propagation predictions for each amateur band between 6 and 160 meters for the period April 15 through June 15, 2001. Beginning this month and continuing through the summer and fall months, the times shown in the charts will be given in local daylight time (EDT, CDT, MDT, and PDT). For detailed predictions of short-skip openings between distances of 50 and 2300 miles, see the Short-Skip Propagation Charts which appeared in last month's column.

VHF Ionospheric Openings

The combination of near-peak sunspot activity and equinoctial propagation conditions makes April a good month for *F2*-layer DX openings on 6 meters. Openings from North America will favor southern and tropical areas such as Africa, the South Pacific, New Zealand and Australia, and Central and South America. Openings are more likely to occur during local afternoon hours, when propagation conditions are High Normal or better. *F2*-layer DX 6 meter openings should decrease considerably by May.

Sporadic-*E* produced short-skip openings begin a seasonal increase during April. Some openings should be possible on 6 meters during the month over distances ranging between approximately 750 and 1300 miles. When the skip is beyond 1100 miles on 6 meters, check for sporadic-*E* openings on 2 meters. An occasional 2 meter ionospheric opening may be possible during April. While sporadic-*E* openings may occur at any time of the day or night, there is a tendency for them to peak between 8 AM and noon and again between 6 and 9 PM local daylight time.

Trans-equatorial (TE) propagation between the US and South America should reach a seasonal peak during April. These openings are most likely to occur on 6 meters, with some also possible on 2 meters, between 8 and 11 PM local time. TE openings favor the southern tier states, but some openings may also be possible to more northerly locations. Unlike *F2*-layer openings, which can produce signals on 6 meters, TE openings are usually very weak, often with severe flutter fading.

Auroras. April is usually quite an active month for widespread auroral displays. These can produce unusual ionospheric openings on the VHF bands over distances of up to approximately 1300 miles. Check the Last-Minute Forecast at the beginning of this column for those days during April that are expected to be Disturbed or Below Normal. These are likely dates for auroral displays and radio storminess.

Meteors. Meteor activity is expected to pick up considerably during April with at least one major meteor shower and possibly a second.

The *Lyrids,* a major meteor shower, should take place between April 16 and 25, peaking at 04 UT on April 22. An average of 15 meteors per hour should enter the Earth's atmosphere during most of the shower period, with as many as 90 an hour during peak intensity. This should be sufficient to permit meteor-

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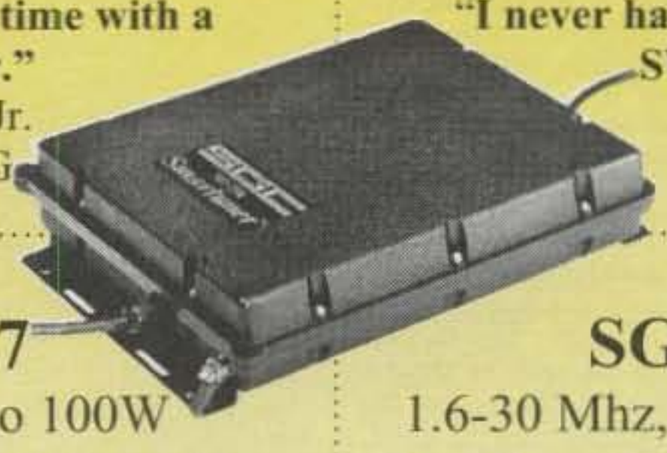

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Jason Hulet - W1WOW

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"It tunes to near 1:1 SWR."
Arnold Knadle—N1JX

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scatter ionospheric openings on the VHF bands.

A second shower, the *Pi-Puppids*, may also take place during April. This is rated as a periodic show which takes place every several years. It may occur during April 15–28, with a maximum expected at 15 UT on April 23. As many as 40 meteors an hour may reach the ionosphere, if this show does occur.

For a much more complete review of VHF propagation, see Joe Lynch's informative "VHF Plus" column appearing monthly in *CQ*. Also see the excellent, comprehensive review of VHF propagation by Ken Neubeck entitled, "Explanations of Unusual Propagation," which appeared in the February 2000 issue of *CQ*.

73, George, W3ASK

HOW TO USE THE DX PROPAGATION CHARTS

1. Use chart appropriate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4, KG4, and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9, and 0 areas; the Western USA Chart in the 6 and 7 areas; and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 meters) for a particular DX region, as shown in the left-hand column of the charts. An * indicates the best time to listen for 160 meter openings.

3. The propagation index is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of days during the month on which the opening is expected to take place as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific propagation index is likely to occur, and the signal quality that can be expected.

4. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. Appropriate *daylight* time is used, not GMT. To convert to GMT, add to the times shown in the appropriate chart 7 hours in PDT Zone, 6 hours in MDT Zone, 5 hours in CDT Zone, and 4 hours in EDT Zone. For example, 14 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 03 GMT, etc.

5. The charts are based upon a transmitted power of 250 watts CW, or 1 kw, PEP on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, and a half-wavelength above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the *propagation index* will increase by one level; for each 10 dB loss, it will lower by one level.

6. Propagation data contained in the charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept of Commerce, Boulder, Colorado 80302.

April 15 to June 15, 2001
Time Zone: EDT (24-Hour Time)
EASTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	10-13 (1) 13-16 (2) 16-18 (1)	07-09 (1) 09-11 (2) 11-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-21 (1)	09-13 (1) 13-15 (2) 15-17 (3) 17-21 (4) 21-01 (3) 01-04 (2) 04-07 (3) 07-09 (2)	19-20 (1) 20-21 (2) 21-00 (3) 00-02 (2) 02-03 (1) 20-21 (1)* 21-22 (2)* 22-00 (3)* 00-01 (2)* 01-02 (1)*
Northern Europe & CIS**	11-16 (1)	08-10 (1) 10-13 (2) 13-16 (3) 16-18 (2) 18-19 (1) 22-00 (1)	06-09 (2) 09-13 (1) 13-16 (2) 16-20 (3) 20-22 (4) 22-02 (3) 02-03 (2) 03-06 (1)*	19-20 (1) 20-23 (2) 23-01 (1) 20-23 (1)*
Eastern Mediter-ranean & Middle East	14-17 (1)	10-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-20 (1)	12-16 (1) 16-18 (2) 18-21 (3) 21-00 (4) 00-02 (3) 02-03 (2) 03-06 (1) 06-08 (2) 08-09 (1)	20-22 (1) 22-00 (2) 00-01 (1) 21-23 (1)*
Western Africa	10-11 (1) 11-12 (2) 12-14 (3) 14-16 (4) 16-18 (3) 18-20 (2) 20-21 (1)	07-08 (2) 08-10 (3) 10-13 (2) 13-16 (3) 16-20 (4) 20-23 (3) 23-04 (2) 04-07 (1)	07-14 (1) 14-16 (2) 16-18 (3) 18-02 (4) 02-05 (3) 05-07 (2)	20-22 (1) 22-02 (2) 02-03 (1) 22-02 (1)*
Eastern & Central Africa	16-17 (1) 17-19 (2) 19-21 (1)	08-12 (1) 12-14 (2) 14-16 (3) 16-19 (4) 19-20 (3) 20-21 (2) 21-22 (1)	14-16 (1) 16-18 (2) 18-19 (3) 19-22 (4) 22-01 (3) 01-04 (2) 04-06 (1) 06-08 (2) 08-09 (1)	21-01 (1) 22-00 (1)*
Southern Africa	10-11 (1) 11-13 (2) 13-14 (1)	08-10 (1) 10-12 (2) 12-14 (3) 14-15 (2) 15-16 (1) 01-03 (1)	12-14 (1) 14-16 (2) 16-17 (3) 17-18 (2) 18-19 (1) 00-01 (1) 01-02 (2) 02-04 (3) 04-05 (2) 05-06 (1) 06-08 (2) 08-09 (1)	21-22 (1) 22-00 (2) 00-02 (1) 22-01 (1)*
Central & South Asia	19-21 (1)	09-12 (1) 15-18 (1) 18-20 (2) 20-22 (1)	16-18 (1) 18-19 (2) 19-21 (3) 21-22 (2) 22-00 (1) 05-06 (1) 06-08 (2) 08-09 (1)	05-07 (1) 19-21 (1)
Southeast Asia	18-21 (1)	08-11 (1) 18-20 (1) 20-22 (2) 22-23 (1)	06-07 (1) 07-09 (2) 09-10 (1) 16-17 (1) 17-18 (2) 18-19 (3) 19-20 (2) 20-21 (1)	05-07 (1)
Far East	18-20 (1)	08-10 (1) 15-16 (1) 16-18 (2) 18-20 (3) 20-21 (2) 21-22 (1)	06-07 (1) 07-09 (2) 09-10 (1) 16-17 (1) 17-18 (2) 18-20 (3) 20-21(2) 21-22 (1)	06-08 (1)
South Pacific & New Zealand	15-17 (1) 17-18 (2) 18-20 (3) 20-21 (2) 21-22 (1)	09-11 (1) 13-15 (1) 15-17 (2) 17-18 (3) 18-21 (4) 21-23 (3) 23-00 (2) 00-01 (1)	19-21 (1) 21-22 (2) 22-23 (3) 23-04 (4) 04-08 (3) 08-09 (2) 09-10 (1)	00-02 (1) 02-05 (2) 05-06 (3) 06-07 (2) 07-08 (1) 02-07 (1)*
Australasia	17-19 (1) 19-21 (2) 21-22 (1)	09-10 (1) 10-11 (2) 11-12 (1) 17-19 (1) 19-20 (2) 20-22 (3) 22-23 (2) 23-00 (1)	23-00 (1) 00-03 (2) 03-05 (3) 05-08 (4) 08-09 (3) 09-10 (2) 10-11 (1) 17-19 (1)	03-05 (1) 05-07 (2) 07-08 (1) 05-07 (1)*
Caribbean, Central America & Northern Countries of South America	11-12 (1) 12-14 (2) 14-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-21 (1)	07-08 (1) 08-09 (2) 09-14 (3) 14-20 (4) 20-22 (3) 22-23 (2) 23-00 (1)	02-06 (2) 06-07 (3) 07-10 (4) 10-12 (3) 12-15 (2) 15-17 (3) 17-23 (4) 23-02 (3)	19-20 (1) 20-21 (2) 21-05 (3) 05-07 (2) 07-08 (1) 21-02 (1)* 02-05 (2)* 05-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	08-10 (1) 10-14 (2) 14-17 (3) 17-19 (4) 19-20 (2) 20-21 (1)	07-08 (1) 08-11 (2) 11-14 (1) 14-15 (2) 15-16 (3) 16-20 (4) 20-22 (3) 22-23 (2) 23-00 (1)	05-06 (1) 06-09 (2) 09-15 (1) 15-17 (2) 17-19 (3) 19-00 (4) 00-02 (3) 02-05 (2)	20-21 (1) 21-04 (2) 04-06 (1) 23-03 (1)* 03-04 (2)* 04-06 (1)*
McMurdo Sound, Antarctica	17-19(1)	16-18 (1) 18-20 (2) 20-21 (1) 02-07 (2) 07-08 (1)	16-18 (1) 18-20 (2) 20-02 (3)	20-01 (1) 01-05 (2) 05-06 (1)

Time Zones: CDT & MDT
(24-Hour Time)
CENTRAL USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	11-17 (1)	07-12 (1) 12-14 (2) 14-18 (3) 18-19 (2) 19-20 (1)	05-09 (2) 09-14 (1) 14-17 (2) 17-19 (3) 19-21 (4) 21-23 (3) 23-01 (2) 01-05 (1)	19-21 (1) 21-23 (2) 23-01 (1) 00-01 (1)*
Northern Europe & CIS**	NIL	10-12 (1) 12-16 (2) 16-18 (1) 21-23 (1)	01-07 (1) 07-09 (2) 09-14 (1) 14-19 (2) 19-23 (3) 23-01 (2)	19-21 (1) 21-23 (2) 23-01 (1)
Eastern Mediter-ranean & Middle East	15-18 (1)	10-13 (1) 13-17 (2) 17-18 (1) 20-22 (1)	13-15 (1) 15-17 (2) 17-20 (3) 20-22 (4) 22-00 (3) 00-01 (2) 01-03 (1)	20-00 (1)
Western Africa	10-12 (1) 12-14 (2) 14-17 (3) 17-18 (2) 18-19 (1)	09-13 (1) 13-15 (2) 15-17 (3) 17-19 (4) 19-21 (3) 21-22 (2) 22-23 (1)	12-15 (1) 15-17 (2) 17-19 (3) 19-23 (4) 23-00 (3) 00-01 (2) 01-03 (1)	20-21 (1) 21-23 (2) 23-00 (1) 21-23 (1)*
Eastern & Central Africa	17-19 (1)	12-14 (1) 14-15 (2) 15-17 (3) 17-19 (4) 19-20 (3) 20-21 (2) 21-22 (1)	13-15 (1) 15-17 (2) 17-19 (3) 19-21 (4) 21-23 (3) 23-01 (2) 01-03 (1) 07-09 (1)	20-23 (1)
Southern Africa	10-12 (1)	09-11 (1) 11-13 (2) 13-14 (3) 14-15 (2) 15-16 (1) 00-02 (1)	14-16 (1) 16-19 (2) 19-22 (1) 22-00 (2) 00-02 (3) 02-04 (2) 04-05 (1) 05-07 (2) 07-08 (1)	20-22 (1) 22-00 (2) 00-01 (1) 22-00 (1)*
Central & South Asia	18-21(1)	16-18 (1) 18-21 (2) 21-22 (1)	05-07 (1) 07-09 (2) 09-11 (1) 18-19 (2) 19-21 (3) 21-23 (2) 23-00 (1)	06-08 (1) 19-21 (1)
Southeast Asia	18-20 (1)	09-11 (1) 11-13 (1) 13-15 (1) 17-19 (1) 19-21 (2) 21-23 (1)	23-03 (1) 03-07 (2) 07-09 (3) 09-11 (2) 11-12 (1)	05-07 (1)
Far East	18-21 (1)	08-11 (1) 15-16 (1) 16-17 (2) 17-21 (3) 21-23 (2) 23-00 (1)	23-02 (1) 02-04 (2) 04-06 (3) 06-08 (4) 08-09 (3) 09-11 (2) 11-13 (1)	03-05 (1) 05-06 (2) 06-07 (1) 05-06 (1)*
South Pacific & New	11-14 (1) 14-16 (2) 16-20 (3)	08-09 (1) 09-11 (2) 11-14 (1)	16-19 (1) 19-20 (2) 20-21 (3)	00-02 (1) 02-04 (2) 04-06 (3)

Zealand	20-21 (2) 21-22 (1)	14-17 (2) 17-18 (3) 18-21 (4) 21-23 (3) 23-01 (2) 01-03 (1)	21-03 (4) 03-07 (3) 07-09 (4) 09-10 (3) 10-11 (2) 11-12 (1)	06-07 (2) 07-08 (1) 02-04 (1)* 04-05 (2)* 05-06 (1)*
Austral-asia	15-17 (1) 17-19 (2) 19-21 (3) 21-22 (1)	08-09 (1) 09-10 (2) 10-11 (1) 16-18 (1) 18-20 (2) 20-22 (3) 22-23 (2) 23-00 (1)	05-07 (3) 07-08 (2) 08-10 (3) 10-12 (2) 12-16 (1) 16-18 (2) 18-21 (1) 21-23 (2) 23-01 (3) 01-05 (4)	02-04 (1) 04-06 (2) 06-07 (1) 04-06 (1)*
Carib-bean, Central America & Northern Countries of South America	09-12 (1) 12-14 (2) 14-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	07-09 (1) 09-11 (2) 11-14 (3) 14-19 (4) 19-21 (3) 21-22 (2) 22-23 (1)	03-06 (2) 06-08 (3) 08-10 (4) 10-12 (3) 12-15 (2) 15-17 (3) 17-23 (4) 23-03 (3)	19-21 (1) 21-22 (2) 22-03 (3) 03-05 (2) 05-07 (1) 21-23 (1)* 23-04 (2)* 04-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	08-10 (1) 10-14 (2) 14-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-21 (1)	07-08 (1) 08-11 (2) 11-14 (1) 14-15 (2) 15-16 (3) 16-19 (4) 19-21 (3) 21-23 (2) 23-00 (1)	05-06 (1) 06-09 (2) 10-15 (1) 15-17 (2) 17-19 (3) 19-00 (4) 00-02 (3) 02-05 (2)	21-22 (1) 22-00 (2) 00-02 (1) 02-05 (2) 05-07 (1) 01-05 (1)*
McMurdo Sound, Antarctica	18-20 (1)	15-17 (1) 17-19 (2) 19-21 (3) 21-23 2) 23-00 (1)	16-18 (1) 18-19 (2) 19-02 (3) 02-04 (2) 04-06 (1)	20-22 (1) 22-00 (2) 00-02 (1) 02-04 (2) 04-06 (1)

April 15 to June 15, 2001
WESTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	09-12 (1) 16-17 (1)	08-11 (1) 11-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	01-07 (1) 07-10 (2) 10-13 (1) 13-17 (2) 17-19 (3) 19-21 (2) 21-23 (3) 23-01 (2)	20-21 (1) 21-23 (2) 23-00 (1) 21-23 (1)*
Central & Northern Europe & CIS**	14-16 (1)	11-14 (1) 14-16 (2) 16-17 (1) 22-00 (1)	02-07 (1) 07-09 (2) 09-13 (1) 13-16 (2) 16-18 (3) 18-22 (2) 22-00 (3) 00-02 (2)	19-23 (1) 21-22 (1)*
Eastern Mediter-ranean & Middle East	Nil	09-11 (1) 11-15 (2) 15-19 (1) 19-21 (2) 21-22 (1)	07-08 (1) 08-10 (2) 10-13 (1) 13-15 (2) 15-17 (3) 17-20 (2) 20-22 (3) 22-23 (2) 23-03 (1)	20-23 (1)
Western Africa	10-14 (1) 14-17 (2) 17-19 (1)	08-12 (1) 12-15 (2) 15-17 (3) 17-19 (4) 19-20 (3) 20-21 (2) 21-22 (1)	02-06 (1) 06-08 (2) 08-15 (1) 15-17 (2) 17-18 (3) 18-22 (4) 22-00 (3) 00-02 (2)	20-23 (1)
Eastern & Central Africa	15-18 (1)	10-12 (1) 12-14 (2) 14-17 (3) 17-19 (2) 19-21 (1) 21-23 (2) 23-00 (1)	11-15 (1) 15-17 (2) 17-19 (3) 19-21 (2) 21-23 (3) 23-00 (2) 00-02 (1)	19-22 (1)
Southern Africa	09-11 (1)	07-09 (1) 09-11 (2) 11-12 (1) 12-14 (2) 14-15 (1)	07-09 (1) 13-15 (1) 15-18 (2) 18-22 (1) 22-23 (2) 02-03 (3) 01-02 (2) 02-03 (1)	19-20 (1) 20-22 (2) 22-23 (1) 20-22 (1)*
Central & South	17-19 (1)	08-09 (1) 09-11 (2)	05-06 (1) 06-07 (2)	05-08 (1)
Asia		11-16 (1) 16-17 (2) 17-19 (3) 19-21 (2) 21-23 (1)	07-09 (3) 09-10 (2) 10-11 (1) 16-18 (1) 18-21 (2) 21-23 (1)	
South-east Asia	12-14 (1)	08-09 (1) 09-12 (2) 12-19 (1) 19-22 (2) 22-23 (1)	04-07 (2) 07-10 (3) 10-11 (2) 11-13 (1) 22-00 (1) 00-02 (2) 02-04 (3)	04-07 (1) 05-06 (1)*
Far East	12-13 (1) 13-15 (2) 15-19 (1)	08-10 (1) 10-17 (2) 17-21 (3) 21-23 (2) 23-00 (1)	04-07 (2) 07-08 (3) 08-09 (4) 09-10 (3) 10-11 (2) 11-12 (1) 12-14 (2) 14-21 (1) 21-23 (2) 23-00 (3) 00-03 (4) 03-04 (3)	01-03 (1) 03-07 (2) 07-08 (1) 03-06 (1)*
South Pacific & New Zealand	11-13 (1) 13-15 (2) 15-17 (3) 17-19 (4) 19-20 (3) 20-22 (2) 22-23 (1)	09-10 (1) 10-12 (3) 12-16 (2) 16-17 (3) 17-21 (4) 21-00 (3) 00-02 (2) 02-03 (1)	06-08 (2) 08-11 (3) 11-12 (2) 12-17 (1) 17-19 (2) 19-21 (3) 21-02 (4) 02-06 (3)	22-00 (1) 00-02 (2) 02-07 (3) 07-08 (2) 08-09 (1) 01-02 (1)* 02-06 (2)* 06-07 (1)*
Austral-asia	13-14 (1) 14-15 (2) 15-19 (3) 19-20 (2) 20-21 (1)	13-16 (1) 16-18 (2) 18-19 (3) 19-22 (4) 22-00 (3) 00-02 (2) 02-03 (1)	05-07 (2) 07-09 (3) 09-10 (2) 10-12 (1) 18-20 (1) 20-21 (2) 21-23 (3) 23-03 (4) 03-05 (3)	01-02 (1) 02-04 (2) 04-06 (3) 06-07 (2) 07-08 (1) 02-03 (1)* 03-05 (2)* 05-06 (1)*
Carib-bean, Central America & Northern Countries of South America	10-12 (1) 12-14 (2) 14-15 (3) 15-18 (4) 18-20 (2) 20-21 (1)	07-08 (1) 08-09 (2) 09-13 (3) 13-19 (4) 19-20 (3) 20-22 (2) 22-23 (1)	00-03 (3) 03-05 (2) 05-06 (3) 06-09 (4) 09-11 (3) 11-15 (2) 15-17 (3) 17-00 (4)	19-20 (1) 20-21 (2) 21-00 (3) 00-02 (4) 02-03 (3) 03-04 (2) 04-06 (1) 21-00 (1)* 00-03 (2)* 03-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	08-11 (1) 11-14 (2) 14-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	07-08 (1) 08-11 (2) 11-14 (1) 14-15 (2) 15-16 (3) 16-19 (4) 19-21 (3) 21-22 (2) 22-23 (1)	00-02 (3) 02-03 (2) 03-05 (1) 05-09 (2) 09-15 (1) 15-17 (2) 17-18 (3) 18-00 (4)	19-22 (1) 22-03 (2) 03-04 (1) 20-03 (1)*
McMurdo Sound, Antarctica	15-19 (1)	15-16 (1) 16-18 (2) 18-20 (3) 20-22 (2) 22-00 (1)	16-18 (1) 18-19 (2) 19-21 (3) 21-01 (4) 01-03 (3) 03-05 (2) 05-07 (1)	21-22 (1) 22-00 (2) 00-05 (1) 05-07 (2) 07-08 (1)

*Predicted times of 80 meter openings. Openings on 160 meters are also likely to occur during those times when 80 meter openings are shown with a forecast rating of (2), or higher.
Six meter openings are likely to occur at times when 10 meter openings are shown with a propagation index of (4) and conditions are High Normal or better.
For 12 meter openings interpolate between 10 and 15 meter openings.
For 17 meter openings interpolate between 15 and 20 meter oenings.
For 30 meter openings interpolate between 40 and 20 meter openings.

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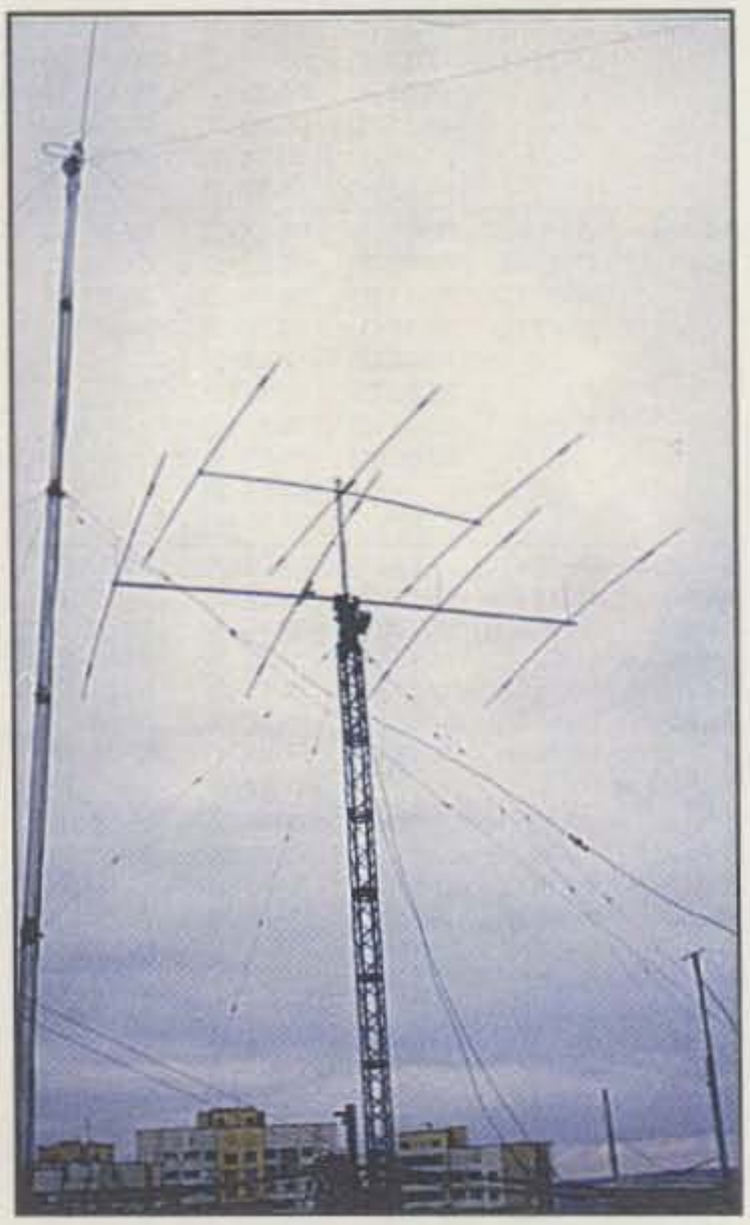
WPX Results *(from page 16)*

Been having a lot of line noise lately. It rained on Friday afternoon and the bands were quiet until Sunday afternoon when the noise started to build back up. The contest gods were smiling down on Polk City....**N4IG**. Although condx was not so good, I have broken my JA record....**JH4UYB**. First WPX contest ever—great fun! Should have paid more attention to the rules before starting; would have spent more time on the low bands....**K1JT**.

Spent about same time as last year (13 hrs) but score not quite as good. More mults but fewer QSOs and not so many from USA nor from 40....**G6QQ**. Very good contest and perfect CW operators. What a pity condx were not quite good....**OK2SWD**. Very low activity especially from USA and a lot of noise!....**SV/OK1YM**. Condx stunk, especially on 10 meters. No way to compete from the NW! Participation seemed down. Is this the beginning of the end for CW contests??....**AI7B**. Great contest/great fun, good condx and worked all states. Thanks for the wonderful WPX contest. Special tnx to my XYL 4F7MHN for keeping the coffee coming....**DU7MHA**. I enjoyed WPX CW as well as WPX SSB contest very much. I will take part in WPX contests next year....**JQ1UXN**. Only a few hours to operate this year due to family visit, but had lots of fun anyway....**N3UM**. A bit rusty after 10 years or so of very little CW work....**WY6K**. Great contest. Always enjoy this one....**KTØR**. Excellent condx! Never thought I could make over 1K QSOs and over 1M points with vertical antennas....**DK5AD**. Had to QRT at 0301 the first night and take XYL to hospital emergency. She's fine now! See you next year....**NV4X**. Rotor and beam took static discharge and was stuck to northeast. Still a lot of fun. My first contest as an Extra....**W4TDB**. Thunder, tornado, and power outage put me off the air, but will be back next year. Great contest; lots of fun....**WW4RR**.

It was nice to operate with nice callsign....**Z37A**. Well, the conditions didn't feel that good, but I hope the score can take this year's Rookie title anyway, but single band this time....**SI3SSA**. Just jumped in at the end to pick up a few countries....**NJ8J**. I had a lot of fun!! Tnx a lot!....**F5PBL**. On the whole, conditions were not quite as good as last year. Also had to deal with rain static on Sunday for most of the day that made copying quite difficult....**W8AV**. Saturday turned out to be a day with very good condx. Sunday with less condx, but then openings for EU on higher bands....**OZ8AE**. 10 meters definitely was *not* the place to be for this contest and this is the sunspot peak....**VE7SV**. No 10 meter anenna but good condx on 15 meters....**OTØA**. My first LP expedition. I like it! Much less equipment, no power generator, much less weight, and lot of fun! Everyone should think about it....**IH9/OL5Y**. Traveling to operate from PY2NY nice 40 meter station was very good while Vitor gone to ZX5J effort. First time like high power; lot of QSOs and so much fun. Thanks PU2VYT (PY2NY YL) for host and sharing your time to help me....**PY2NDX**. Weird propagation, lack of US stations, had fun on high band for change....**VE3BMV**. Strategy was wrong this time! Too much time spent on 40 and 10 meters. Could not make much better with my small 2×3-500Z linear amplifier....**S59A**. As much as I geared up for this test, my yard work took priority....**VE6ZT**.

My first contest using computer logging. What a great system. I did not miss using dupe sheets one bit....**NEØP**. My highest QSO count in a contest. *Ever*....**NR1DX**. North-south was working; east-west wasn't. Very, very slow from here....**KH6ND**. Thanks to LU7DW, LU6EBY, LU9DMC. Operated from my father's workshop in the middle of the city. Too much line and car transit noise and very limited space, couldn't use computer logging due to this. Still had fun



This is the antenna farm of European low power champion ER6A, operated by ER1LW.

CW & SSB CLUB COMPETITION

CLUB (no. of entries)	SCORE
CONTEST CLUB FINLAND (80)	**251,675,922**
YANKEE CLIPPER CONTEST CLUB (60)	**164,864,641**
NORTHERN CALIFORNIA CONTEST CLUB (53)	147,214,257
SLOVENIA CONTEST CLUB (49)	135,792,802
POTOMAC VALLEY RADIO CLUB (62)	131,250,602
RUSSIAN CONTEST CLUB (33)	108,473,465
APHRODITE CONTEST GROUP (9)	106,546,328
FRANKFORD RADIO CLUB (24)	97,091,082
RHEIN RUHR DX ASSOCIATION (35)	92,427,984
ARAUCARIA DX GROUP (9)	84,650,201
CROATIAN CONTEST CLUB (19)	80,480,971
YU CONTEST CLUB (21)	75,280,201
BAVARIAN CONTEST CLUB (42)	70,046,036
MARCONI CONTEST CLUB (14)	66,957,661
UNION DE RADIOAFICIONADOS ESPANOLES (32)	61,841,606
KAUNAS UNIVERSITY OF TECHNOLOGY RADIO CLUB (32)	60,813,993
MAD RIVER RADIO CLUB (11)	55,896,444
LES NOUVELLES DX GROUP (16)	53,085,222
SOUTHERN CALIFORNIA CONTEST CLUB (23)	50,400,722
NORTH TEXAS CONTEST CLUB (16)	46,499,261
FLORIDA CONTEST GROUP (17)	41,863,293
UKRAINIAN CONTEST CLUB (38)	41,774,087
SOCIETY OF MIDWEST CONTESTERS (25)	36,257,540
SOUTH EAST CONTEST CLUB (7)	34,383,819
WILLAMETTE VALLEY DX CLUB (10)	33,641,973
NORTH COAST CONTESTERS (5)	31,774,478
TuPY DX GROUP (26)	29,707,533
LOW LAND CRAZY CONTESTERS (6)	28,787,523
ALBERTA CLIPPERS (8)	28,779,279
SOUTHWEST OHIO DX ASSOCIATION (8)	26,955,788
CZECH CONTEST CLUB (7)	26,771,865
OKLAHOMA DX ASSOCIATION (5)	26,148,715
TENNESSEE CONTEST GROUP (18)	24,487,397
LITHUANIAN DX GROUP (10)	24,274,659
URAL CONTEST GROUP (18)	23,620,728
MOSCOW CONTEST CLUB (5)	20,190,796
WESTERN WASHINGTON DX CLUB (13)	19,478,024
TEXAS DX SOCIETY (6)	19,386,648
TOP OF EUROPE CONTESTERS (10)	19,281,545
SKY CONTEST CLUB (3)	18,834,294
HA DX CLUB (6)	16,815,836
KIEV CONTEST GROUP (4)	16,651,826
CENTRAL TEXAS DX & CONTEST CLUB (3)	14,888,648
GACW (8)	14,069,978
MINNESOTA WIRELESS ASSOCIATION (6)	13,844,248
CAJUN CONTEST CLUB (4)	11,590,397
CRIMEAN CONTEST CLUB (7)	10,733,171
BELARUS CONTEST CLUB (5)	10,148,321
WORLD WIDE YOUNG CONTESTERS (10)	9,758,763
BC DX CLUB (6)	9,672,326
CENTRAL SIBERIA DX CLUB (6)	8,315,113
VRHNIKA CONTESTERS (3)	7,799,486
CENTRAL ARIZONA DX ASSOCIATION (6)	7,199,985
GRAND MESA CONTESTERS (7)	7,038,227
CHILTERN DX CLUB (3)	7,007,090
LYON DX GANG (3)	6,945,652
LYNX DX GROUP (4)	6,762,613
CAROLINA DX ASSOCIATION (4)	5,969,068
YU DX CLUB (7)	5,683,520
TEAM PANTELLERIA (3)	5,430,385
DANISH DX GROUP (4)	5,310,370
SP DX CLUB (14)	5,120,612
ORDER OF BOILED OWLS (4)	4,803,714
UX2FXX CONTEST CLUB (5)	4,630,658
WESTERN SIBERIA DX CLUB (3)	4,351,912
SARAJEVO CONTEST GROUP (6)	4,223,915
LIMA ALFA CONTEST CLUB (4)	4,188,079
VOJVODINA CONTEST CLUB (3)	4,075,426
UNION FRANCAISE DE TELEGRAPHISTES (7)	3,384,368
URE CARTAGENA (5)	3,347,048
ROCHESTER DX ASSOCIATION (8)	3,311,505
FOX CONTEST CLUB (13)	3,243,503
MISSISSIPPI VALLEY DX/CONTEST CLUB (3)	3,116,134
WORLDRADIO STAFF AMATEUR RADIO CLUB (5)	3,021,165
NOVGOROD RADIO CLUB (5)	2,286,496
YO DX CLUB (3)	2,125,318
SARATOV CONTEST CLUB (3)	1,936,164
MACEDONIA DX & CONTEST GROUP (4)	1,887,279
PHILIPPINE DX FOUNDATION (4)	1,812,285
WESTERN NY DX ASSOCIATION (4)	1,491,884
OBNINSK "QRU" CLUB (4)	1,250,460
SP CONTEST CLUB (5)	1,246,472
NORTH PATAGONIA DX GROUP (3)	1,215,014
AMSTERDAM DX CLUB (3)	1,184,450
NORTHERN ARIZONA DX ASSOCIATION (5)	684,396
NORTHROP GRUMMAN RADIO CLUB (3)	587,612
GEO DX GROUP (3)	428,511
VLADIMIR'S RADIOCLUB (3)	235,553
GUARA DX GROUP (3)	54,676

CONTINENTAL LEADERS

AFRICA

1.8	No Entry	
3.5	No Entry	
7	*ZS6MG	185,256
14	*CT3/DL3KWF	6,660
21	EA8ASJ	378,378
28	*ZS5RON	50,264
AB	3V8BB	11,415,184

ASIA

1.8	*JE1SPY	90
3.5	UN7LO	184,632
7	4Z5AX	814,540
14	*RUØSN	1,506,025
21	5B4/RW9UP	3,070,419
28	5B4/RA9JX	2,715,866
AB	P3A	10,090,962

EUROPE

1.8	9A2AJ	125,388
3.5	OK5DX	496,128
7	9AY2K	2,308,670
14	9A5W	3,213,280
21	9A3GW	4,411,860
28	T99W	2,115,365
AB	OHØZ	7,240,444

NORTH AMERICA

1.8	K1ZM	3,465
3.5	W8AEF	26,076
7	WE1USA	567,155
14	VA7RR	3,242,172
21	VE3BMV	3,367,964
28	N4BP	1,297,890
AB	KQ2M	6,486,690

OCEANIA

1.8	No Entry	
3.5	No Entry	
7	No Entry	
14	No Entry	
21	No Entry	
28	KH6ND	1,523,008
AB	NH7A	4,308,062

SOUTH AMERICA

1.8	No Entry	
3.5	No Entry	
7	PY2NDX	3,005,954
14	LU5FA	1,602,536
21	PY1KN	2,091,726
28	LU5CW	5,531,399
AB	FY5KE	9,625,620

MULTI-OPERATOR SINGLE TRANSMITTER

AF	No Entry	
AS	5B4AGD	12,527,593
EU	9A7A	9,091,620
NA	6Y8A	13,931,420
OC	4G1A	3,091,299
SA	HC8N	18,422,455

MULTI-OPERATOR MULTI-TRANSMITTER

AF	No Entry	
AS	JA3YBK	2,187,920
EU	4OØA	20,932,902
NA	WL7E	15,833,953
OC	No Entry	
SA	PY3MHZ	1,620

as always....**L99D**. Good propagation especially on 15/20 and amazing amount of activity....**N8LM**. The anticipation was for better conditions and a higher score, but I was barely able to hold onto a score close to last year's!....**KN7Y**. Thanks to OK1KSW/OK5W group for letting me use their fine station. Thanks for a nice contest!....**OK5W**. Propagation very good, specially in the first day. Thanks a lot to my YL Donna for help during the contest....**IK4MTF**. First time single band on 80 meters. Had a lot of time for kids!....**S57U**. Thanks to Dave, VE3OI, for the use of his great station....**VA3UZ**. Bad propagation on 28 MHz. Still had noise on 14 MHz and 21 MHz; best WPX contest in 2000....**YBØZZ**. Used a new rig and new software for my first WPX CW test. Took me an hour to make the first contact. Nothing like a challenge....**WS7V**.

Bad propagation; for the first time I had to use DX cluster....**4N1SM**. The weather was too beautiful in Santa Cruz this weekend to stay in front of the radio....**ND6E**. Worse than last year. Didn't finish antenna work until nearly 4 hours after contest start! Storm fried lightning protector and damaged relays on tower necessitating nighttime tower climb....**K5RX**. I had less than 16 hours to enjoy the contest but it's always a must in the calendar!....**IT9BLB**. After my flush with success last year from shattering the USA 15 meter LP record with over 1 mega point in 30 hours, I decided to try LP all band. What a humbling experience! This score will be lucky to make the bottom of the LP top ten. It really hurt to hear the W4's and W5's running Russians on 10 meters Sunday afternoon that I couldn't hear. Guess that's why it's called a "black hole"....**N4TZ/9**. Madness or what? Arrived home on the Saturday morning from Australia after a three-week absence on a DXpedition to Wallis (FW) and immediately dived into 17 hours of activity in the WPX CW Contest....**G3TXF**. What a contest! Closest battle ever with OH8L! Thanks to my wife, Merja, for letting me contest for another weekend....**OH9W**. Almost all QSOs were search and pounce....**KY5N**. Very bad start, as I woke up at 04Z and realized that my alarm clock did not work. I lost the only good opening on 20 meters....**OH6NIO**. My first experience, worked 36 hours. I enjoyed this contest very much....**JE1REU**. This was my first CQ WPX Contest! It was a nice experience and a nice contest....**SM3AVW**. At the end of the first day I'd already broken my record set last year and expected to shatter it Sunday. I'd forgotten what a drag the second day can be! Great EU opening Saturday and apparently I worked everyone there was to work....**N4BP**. Ten is always great fun if you can enter only for a few hours in the contest....**F6IIE**.

OHØ, E41, TZ6, and OD5—pretty good for casual contesting....**KE9EX**. Sleeping all over the night and equipment failure did not help to increase the score....**S5A**. Worked HSØAC as a new one on 80....**SP5GH**. YQØKAR is a special call for YO2KAR for 40 years of activity....**YQØKAR**. Super bad DX conditions during all the contest on 80 meters!....**CO8ZZ**. This really is the best contest of the year with plenty to work. The bands were better than last year with most bands showing activity through the night....**G3OOU**. On 1 April our JA amateurs became able to

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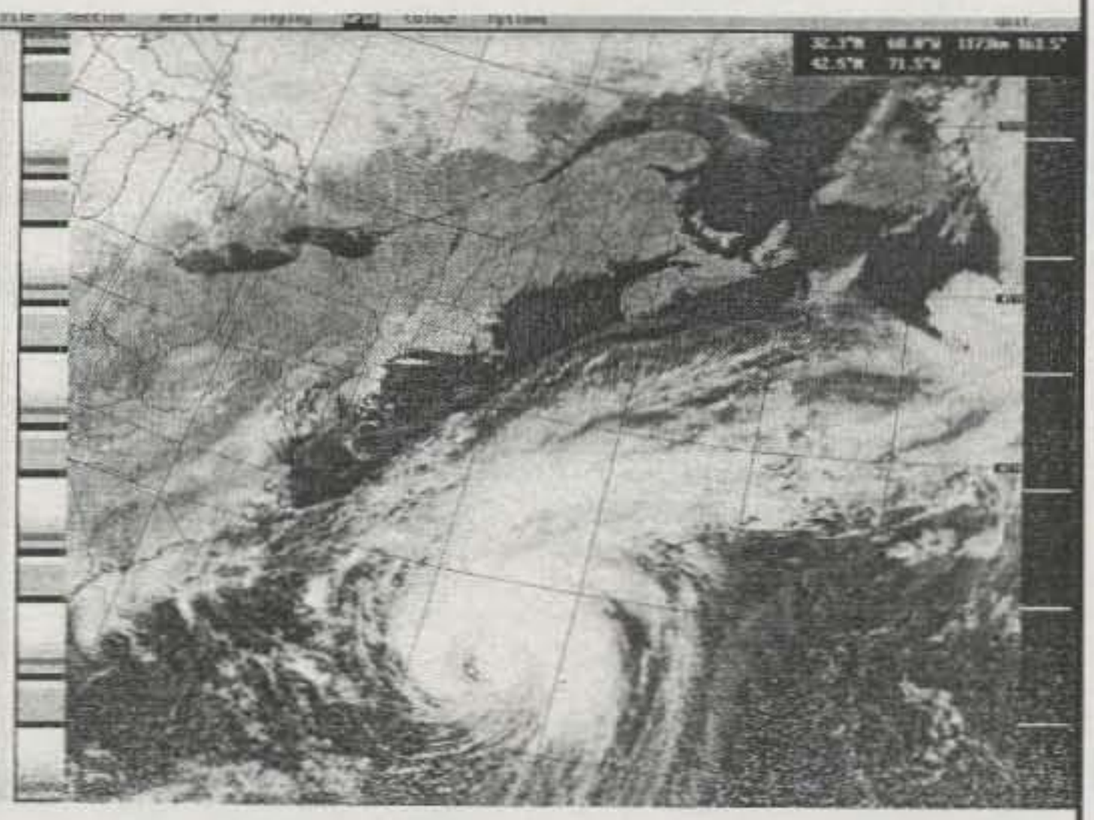

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use 1810–1825 KHz. I called CQ on 1810 during sunrise time of the USA west coast but I could not QSO any stations and not hear any. I could hear AI7B and WL7E on 80 m eter band, but I could not hear them on 160.... **JE1SPY**. After many weeks of discussion with Mrs Whyn of Nassau PUD, Carnival Cruise Line and the Fantasy Purser and Radio Officer, I was allowed to operate from 8 PM to 3 AM local time Friday night with a power of 20 watts from the children's play area in the back of the ship. With my HW16 and HG10 VFO and a 60 ft. wire hung off the stern, I could work 'em as fast as I could push my J38!....**W7DRA/C6A**. Worked 3V8 for a new one!....**VK6HG**. Operated near Iran....**KC7JEF/MM**. Had lots of fun. I just wish 10 meters would have been better. Look forward to next year....**WDØAVV**. Wanted to go far, but my computer had a different opinion....**ISØ/YO3RA**. My first CW contest....**PA1MRK**. This is my 23rd CQ WPX Contest and my 2,210th contest log entry overall....**YU7SF**.

This was first-ever use of Z35 prefix. I was new multiplier to all stations I worked!....**Z35M**. Thanks to all the fine ops who copied my 5 watts!....**W3BBO**. Fun! Fun! Fun! But lot's of room for improvement on my part!! As usual....**KG5U**. I have trouble working western Russia; Galapagos Isl. no problem!.... **GM4HQF**. My usual score in this contest is 15–30K. I guess the call and the 2-ele Yagi up 100 feet at TI5KD's QTH helped!....**TE1W**. Trying mostly for new countries with milliwatts (20 mw out). Now have 74 confirmed....**W9PNE**. Condx not so good this year. Found it hard going on QRP for the DX, but all good fun and picked up a few new QRP countries....**G3LHJ**. Thanks to Keko, TI5KD, for the use of his station.... **TI5N**. Thanks again to everyone I managed to work. Beat my number of QSOs this time....**MØO**. Wonderful condx for QRP on 10 meters!....**OK1MGW**. Conditions pretty good Friday night and Saturday but lousy on Sunday....**N9CIQ**. I had a great time working the USA from my bicycle mobile station....**DL/K3TW/M**. What a great contest for QRP—my first QRP effort. Lots of strong signals with good ears, small pile-ups, and not too crowded. Even worked a new one (TZ6DX) with my 5W!....**N4OT**. This was a very light effort. Basically "Hey, can I come play radio for a while?" was asked by a few of the regular barnstormers....**KB1H**.

Warming up for WRTC-2000!....**OH9A**. First participation to this very nice contest. We will be there next year....**ON5VL**. Oh to be in the Caribbean again running 10 meters!!....**K7AW**. What two operators can do more without cluster and multiplier station? Short skip help us to make many EU QSOs on high bands. See all you guys in Slovenia....**Z3ØM**. This was a "practice" session for WRTC. East coast contesting sure is different!!!....**WK6LA**. K7BV and K9ZO got together for a warm up for WRTC. K9SD was an excellent host. Conditions were very noisy on 20 at night and we had to QRT due to thunderstorms....**KW9DX**. Old timers team was operate in old-fashioned style without using any tricks, like packet cluster, etc. In spite of bad propagation, result is not very bad.... **YL4U**. This time of year in TX you gotta love the thunderstorms. We lost 5 hours with the storms and no power for 3 hrs. The tornado 2 miles away added some thrills, too!....**NM5O**. It was fun to be neck and neck in QSOs with HC8N! Too bad we were in a "half point" country....**6Y8A**. It was the best contest we have taken part in....**OM2I**.

Nice contest. The conditions were not the best, a lot of problems forced us to use only one station, so we just operated full time one after another op. I think also there was not enough activity....**S5C**. We had been strongly hit by bad luck this time and operated more for fun at the end, not serious anymore. The 1000MP lost its display, a lightning strike on the tower, no damage good grounding....**4F1RWW**. Indy 500, World 600, and nice weather left a few minutes here and there for this contest....**N2DEM**. This was the Carolina DX Association's attempt to provide the WY2 prefix and the WY2OOO call/QSL card to any and all who desire it....**WY2OOO**. All Yagis mounted on a single 42 meter rotating tower. Using only one direction for all Yagis caused some fights between the operators....**8S5X.** Had Harry, RA3AUU, as a last-minute guest. Before he left, we had him eating grits and saying "Y'all"....**NR4M.**

Station Operators
Multi-Op Multi-Transmitter

4ØØA: YU1DX, YU1IG, YU1JW,YU1UH, YU1ZZ, YZ1AU, YU7AV, YU7BJ, YU7CM, YU7CB, YU7GW, YU7GO, YU7NW, YU7NU, YU7KW, YU7JX, YT7KF, YT7WA, YZ7UN, 4N7DW, Attila. **8S5X**: SM5AJV, SMØGNS, SM5HJZ, SMØHPL, SMØIHR. **AN4ML**: EA4AMO, EA4DRV, EA4ET, EA4MC, EA4TX. **DFØWA**: DL1IAO & DL2MEH. **ES5Q**: ES2RR, ES5MC, ES5QX, ES5RN, ES5RY. **HG6Y**: HA2NA, HA2RX, HA3OV, HA6OB, HA6OI, HA6ON, HA6OY, HA6ND, HA6NL, HA6NY, HA6PS, HA6PX, YO5BRZ. **JA3YBK**: JI3OPA & JR4ISF. **K1MK**: K1MK, K1TTT, KB1W, W1VE. **K2XR**: K2XR & VA3UA. **LY7A**: LY2HK, LY1DI, LY2OC, LYR-346, LY3IT, LY3DA, LY3HD, LY3BAD, LY2BMX, LY2MV, LY2UF, LY4AA, LY2AO, LY2NK, LY2KZ, LY1EE. **NJ4U**: K4EA & K4TW. **NR4M**: K7SV, NR4M, K1SE, K4EU, K4EC, RA3AUU, K4GMH, K4ZW, WA4JUK. **NY4A**: K2AV, W2CS, N4AF, N4CW. **OL7W**: OK1DUT, OK1FUT, OK1VBA, OK1EP, OK1FDR, OK1TA, OK1FKV. **OZ5WQ**: OZ1BIZ, OZ3ZW, OZ5WQ. **PY3MHZ**: PY3ABT, PY3ADY, PY3AFS, PY3BZA, PY3FOX, PY3TMR, PY3YY. **SKØX**: SMØKCO, SMØCCT, SMØCOL, SMØDRD, SMØMXO, SMØXGL, SM3UZS, SM3VAC. **W4MYA**: W4DR, W4HJ, WA4QDM, WK4Y, WU4G, W4MYA, Lilly. **WL7E**: WL7E, KL7Y, KL7FH, KL9A, WA2GO, NL7Z. **WR3L**: WR3L, WR3Z, N3NT, K3FT, AA3SD, KA3TUL. **WY2OOO**: AA4S, AA4NN, K4ZA, N4ZC, W4SI.

Multi-Op Single Transmitter

4D1X: DU1COO, DU1EGA, DU1JXP, DU1MHX, DU1EV, DU1MHZ, DU1UWF. **4F1RWW**: 4F1RWW & DU1/DK3GI. **4G1A**: DU1WHO, 4F1BYN, 4F1FZ, 4F3XX, DU1PEX, 4D1PMD. **5B4/RS3A**: YL2KL, RA4LW, RZ3BW, UA4RC, RA3CQ. **5B4AGD**: YT6A, YT6T, YT3T, YU1RL, S56A. **6Y8A**: K2KW & K6XX. 8S2F: SM2LIY, SM2ODB, SM2NOG. **9A7A**: 9A8A, 9A2ME, 9A3OS, 9A3TR, 9A4PA, 9A4RX, 9A6DM, 9A2OP. **AB2E**: AB2E & K3WW. **AM7ALM**: Club Group. **AN2RCA**: Club Group. **AN6IB**: EA3AIR, EA5BM, EA6FB. **DF1LX**: DF1LX, DF5JT, DL7ANR, DL7JV. **DJ7TO**: DJ6TF, DJ7TO, DK4WA, DL7IO, DL7URH. **DLØDX**: DL5JS, DL5KUT, DK2OY. **DLØMZ**: DK1EI, DF2PI, DJ8KZ, DL4FN. **E41/OK1DTP**: OK1DTP, OK1FHI, OK2BZM. **EN7Z**: UR3QCW, UT3ZZ, UY5ZZ. **EU5F**: EU6DX, EU6TT, EV6M, EW6AF, EW6AL, EW6AW, EW6MM. **F6KDF**: F5NOD, F6JJX, F5ROP, F8BWB. **F6KPH**: F6DTZ, F5TLS, F5SEP. **F8KHZ**: F6GQO, F8BNV, F5OGL. **HC8N**: N5KO & K6AW. **HSØAC**: E21CJN, E21EIC, HSØGBI, HS1CKC, HS6NDK. **II1R**: I1NVU, IK1CLP, I1HJT, IK1QBT. **IY4W**: IK4UPB, IK2QEI, DL6RAI, DL2NBU. **JA1YNE**: JN1MSO & JP1OGL. **JA1YPA**: JA1PEJ, JH1FDP, JK2RCP. **JA2YKA**: Masamori, Kenta, Tackashi, JH3FBK, JL7JRO, JI4RDO, JE2PCY. **JE2YHS**: JA2OLJ, JR2JVR, JE2WWB, JG2NUD, JI2XUT, JR2JPU, JJ2CEE. **JE4VVM**: JE4VVM, JG4CLV, JH4UHW, JN4FEU. **JJ3YBB**: JA3PJL, JF3MOK, JF3RLG, JS3VEX. **JU4Y**: IØSNY, I1QOD, I1ZB, JT1CD, JT1BH. **K7AW**: KI7Y, K7ZUM, K5ZM. **K7RI**: NØAX, W7WA, NW7DX. **KB1H**: KB1H, N1XS, NB1U. **KW9DX**: K7BV & K9ZO. **LA1K**: LA3ZKA, LA4TKA, LA4VKA. **LX9DIG**: DL5SE & DK4ARL. **LZ9A**: Club Group. **N2DEM**: N2DEM & K2CDJ. **N3BB**: N3BB, N3AD, K5PK. **N7WA**: W7CAJ, W7/JR1NKN, N7WA. **NB3O**: NB3O, K3TC, K3TM, N3GM, K3NCO. **NC7J**: NG7M, W7CT, W7FB. **NM5O**: OH7WV, N5UM, WXØB, W5GN, AD5Q, NM5M, K5OT, N5YA, N5KR.

OD5/OK1MU: OD5/OK1MU & friends. **OF3F**: OH1MM, OH1VR, OH2MA. **OH2U**: OH2XX, OH4YR, OH7BX, OH7JR. **OH7M**: OH1WZ, OH4XX, OH6LNI, OH7KD, OH7MHL. **OH9A**: OH1EH & OH1NOA. **OK1KAO**: OK1MPM & OK1FMX. **OK6L**: OK2SWD & OK2WHG. **OL5Q**: OK1HRA, OK1FFU, OK1AYE. **OL8M**: OK1DRQ, OK1AY, OK1CM, OK1FCJ. **OM2I**: OM3RG, OM6TY, OM1KW, OM1II. **OM3KZA**: OM2ZZ, OM6MW, OM3CUG, OM3TPN. **ON5VL**: ON4VL, ON6TJ, ON4KLG. **PA3HBB**: DF5RF & PA3HBB. **RD3Q**: RW3QC, RN3QO, RN3QY, RX3QAK, UA3QDX. **RI3A**: RX3DUK, RK3FM, RU3DGD, RK3FT. **RK3QWM**: RA3QH, RA3OU, UA3QJJ. **RK3RWL**: RN3RC, RU3RQ, RK3RX, UA3RS, UA3RPM. **RM6A**: RN6BN, RA6CM, RA6CO, RA6AX. **RU1A**: RW1AC, RV1AW, RX1AA, Alex. **RU6LWT**: RU6MM, RV6LGY, RV6LVW, Pavel. **RW9C**: RA9CGA & RW9CF. **RZ4ZWR**: Eugen, Vlad, Paul. **RZ9WXK**: Vlad, Albert, Sasha. **S57CQ**: S57CQ & S52T. **S5C**: S5ØR, S5ØTA, S5ØU. **SP3PFR**: SP3MGP & SP3FLR. **TF3IRA**: TF3GB, TF3DX, AD7U, N6HR. **UX2FXX**: UT9FJ, UR5FEO, US-F-55. **V25A**: N3OC & N5NJ. **VE5RI**: VE5FF, VE5FN, VE5WI, VE5ZX, VE6EZ. **VE6AO**: VE6CIZ, VE6IC, VE6KC, VE6RTL, VE6TC. **VE7UF**: VE7ZO & VE7UF. **W6YX**: W6KNS, W6LD, N7MH. **WK6LA**: K6LA & K5ZD. **YL4U**: YL3DW, YL2GD, YL2PP, YL2KO. **YL7C**: Club Group. **YO8KOS**: YO8AXP, YO8BPK, YO5OHO. **YU1AAT**: 4N1MD, 4N1RK, 4N1MP. **Z3ØM**: Z31GX & Z31JA. **ZX5J**: PP5MCB, PP5UA, PP5WG, PP5JR, PY3MM, PY2TI, PY3PAZ, PY2NY, PY2TI, Nicolau.

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Looking Ahead in CQ

Here are some of the articles that we're working on for upcoming issues of *CQ:*

- *CQ* Reviews: Patcomm PC-500 Transceiver, by WB2AMU
- "Fun in the Sun, and Power From It," by K8WPI
- "The Station Controller," by AF1US
- "Electricity Everywhere," by W6BNB

Plus:

- "Contesting from A61AJ," by K2RED
- "Transforming a Transformer," by VE3ERP
- "Add Scanning to Converted CB Rigs," by WB9YBM
- "The Aviator's Solution to Shack Noise," by KF2LF

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Number groups after call letters denote following: Band (A = all), Final Score, Number of QSOs, and Prefixes. An asterisk (*) before a call indicates low power. Certificate winners are listed in boldface. (Note that the country names and groupings reflect the DXCC list at the time of the contest.)

CW RESULTS

QRP/p

TI5N	**A**	**1,976,118**	**1382**	**554**
			(Op: NØKE)	
UN4L	**A**	**1,184,462**	**942**	**449**
			(Op: RN9AO)	
LY2FE	**A**	**1,173,322**	**1259**	**529**
HA2A	**A**	**1,154,531**	**1180**	**497**
VE1ZJ	**A**	**1,013,502**	**803**	**409**
LY1DT	"	877,030	1067	469
KG5U	**A**	**843,192**	**863**	**441**
YU1LM	**A**	**770,784**	**1006**	**434**
S53MA	**A**	**709,243**	**960**	**443**
VE3KP	**A**	**631,104**	**616**	**346**
N7IR	**A**	**551,688**	**618**	**362**
UA1OZ	**A**	**500,490**	**687**	**402**
RA9SO	**A**	**458,955**	**458**	**279**
K7RE	**A**	**428,247**	**534**	**311**
RQØJ	**A**	**403,056**	**675**	**324**
			(Op: RAØJJ)	
VA7AM	**A**	**381,769**	**514**	**289**
SMØJ	**A**	**303,800**	**573**	**310**
AA1CA	**A**	**288,133**	**449**	**289**
LU8VCC	**A**	**238,952**	**346**	**238**
W4DEC	**A**	**235,848**	**447**	**248**
N9CIQ	**A**	**230,300**	**361**	**245**
RU3WW	"	210,158	379	274
JA5CDL	**A**	**197,792**	**362**	**224**
UAØKCL	"	169,703	300	223
MØO	**A**	**169,672**	**449**	**254**
			(Op: G4JZO)	
W3BBO	**A**	**160,146**	**334**	**217**
OM3TKR	**A**	**146,583**	**351**	**267**
YO4AAC	**A**	**145,632**	**382**	**246**
GM4HQF	**A**	**138,516**	**326**	**238**
DL1LAW	**A**	**133,476**	**444**	**227**
DK4CU	"	124,118	327	229
SP5XSB	**A**	**110,143**	**324**	**209**
DL5CL	"	101,222	310	214
AC7AF	"	99,102	288	199
OK1AIJ	**A**	**54,352**	**207**	**158**
YO4CSL	"	50,050	201	154
WZ2T	**A**	**47,302**	**156**	**134**
LY2OU	"	46,350	187	150
W8UE	**A**	**44,278**	**201**	**131**
KA8NRC	"	43,296	159	123
NQ7X	"	43,188	140	118
G4FDC	"	41,942	157	134
SP4TBM	"	37,884	160	154
ON7CC	**A**	**30,360**	**150**	**120**
K2CY	"	30,210	132	114
UA3UNP	"	22,072	111	89
OZ5DX	**A**	**20,330**	**113**	**95**
7K1CPT/1	"	20,169	106	83
N2LK	"	12,896	72	62
DJ5QK	"	8,875	89	71
W9LT/7	"	7,250	85	58
W9PNE	"	4,120	40	40
K5OI	"	3,400	61	50
PAØRBO	**A**	**2,695**	**49**	**49**
LU7EE	**28**	**1,075,612**	**868**	**436**
PQ2Q	**28**	**439,752**	**512**	**292**
			(Op: PY2WC)	
4X1VF	**28**	**352,683**	**457**	**263**
F6GOE	**28**	**185,460**	**432**	**281**
9A3GU	**28**	**122,976**	**324**	**244**
RA3OU	**28**	**31,416**	**145**	**136**
OK1MGW	**28**	**29,510**	**142**	**130**
HAØGK	**28**	**15,834**	**112**	**91**
OK1DCP	"	4,320	67	60
NA4CW	**21**	**427,986**	**512**	**354**
RZ6HX	**21**	**408,432**	**574**	**402**
N4OT	"	251,658	354	279
ES1CR	**21**	**228,557**	**411**	**317**
W3PP	**21**	**180,063**	**280**	**247**
DL8TWA	**21**	**149,702**	**342**	**259**
			(Op: K3TW)	
WA6FGV	**21**	**105,763**	**279**	**203**
DL1DQY	"	103,186	245	207
W1CTN	**21**	**27,169**	**110**	**101**
EW6DR	"	5,244	50	46
DJ1YFK	**14**	**707,230**	**608**	**394**
RZ6HGD	**14**	**173,436**	**387**	**291**
G3LHJ	**14**	**140,448**	**328**	**266**
FM5CW	**14**	**100,672**	**249**	**176**
EA5GX	**14**	**91,761**	**267**	**219**
GWØVSW	**14**	**82,894**	**270**	**217**
SM6WXO	**14**	**68,411**	**274**	**203**
S59AV	**14**	**57,474**	**219**	**186**
LU3VED	**14**	**24,024**	**100**	**88**
YU1OO	**14**	**16,170**	**122**	**105**
EA1BYA	**14**	**4,176**	**66**	**58**
DL5ANS	"	3,038	50	49
DL/K3TW/M	"	1,232	23	22
TE1W	**7**	**306,819**	**297**	**219**
			(Op: W8QZA)	
YO9GZU	**7**	**187,798**	**343**	**233**
JA2HUN	**7**	**34,131**	**118**	**93**
UY6IM	**3.5**	**215,695**	**381**	**241**
SP4GFG	**3.5**	**162,122**	**342**	**206**
OM3THV	**3.5**	**32,205**	**138**	**113**
YT1IA	**1.8**	**1,248**	**26**	**24**

SINGLE OPERATOR NORTH AMERICA

UNITED STATES

KQ2M	**A**	**6,486,690**	**2830**	**805**
NT1N	**A**	**5,667,572**	**2650**	**794**
AK1N	**A**	**4,882,240**	**2388**	**730**
			(Op: W1WEF)	
WC1M	"	4,659,020	2403	710
KR1G	"	4,378,050	2236	690
K5MA	"	4,002,580	2039	670
NR1DX	"	3,897,702	1963	711
K1LU	"	1,354,420	1015	482
W1FJ	"	81,144	211	168
K1ZM	**1.8**	**3,465**	**40**	**35**
***K1VUT**	**A**	**2,666,260**	**1549**	**580**
***W1TO**	**A**	**620,655**	**621**	**345**
***AA1SU**	**A**	**531,307**	**645**	**343**
*NN1NN	"	331,188	472	286
			(Op: N1DS)	
*KR1B	"	254,421	365	243
*KQ1V	"	247,245	366	265
*W1TW	"	118,374	248	181
*AB1BX	"	96,976	229	176
***WA1FCN**	**21**	**541,947**	**549**	**393**
***WE1USA**	**7**	**567,155**	**633**	**335**
NB2Q	**A**	**4,800,976**	**2256**	**764**
			(Op: N1EU)	
N2ED	**A**	**2,515,185**	**1553**	**601**
KW2J	**A**	**1,735,128**	**1257**	**522**
K2SX	"	891,756	796	414
N2GC	"	720,295	667	355
W2EZ	"	428,428	513	308
W2FUI	"	123,825	255	195
W2UDT	"	34,402	121	103
***WK2G**	**A**	**1,525,443**	**1142**	**499**
***N2CU**	**A**	**886,464**	**777**	**432**
***K1JT**	**A**	**444,912**	**569**	**312**
*WA2EYA	"	249,000	364	250
*NY5C	"	6,732	60	51
***KD2P**	**14**	**25,576**	**100**	**92**
***WB2DVU**	**7**	**264,750**	**373**	**250**
AA3B	**A**	**4,123,000**	**2038**	**700**
K3ZO	**A**	**3,470,688**	**1770**	**648**
AA3TT	**A**	**2,380,738**	**1481**	**589**
N3UM	"	45,994	143	122
W3AZ	**28**	**130,088**	**239**	**202**
WY3T	**14**	**263,297**	**363**	**281**
***N1WR**	**A**	**1,490,676**	**1044**	**491**
***WF3M**	**A**	**929,070**	**830**	**405**
***W2GG**	**A**	**630,329**	**630**	**371**
*KE3VV	"	451,972	504	313
*N4XU	"	431,550	478	315
*W3DAD	"	264,252	368	244
*N3NZ	"	150,336	279	192
*K3DSP	"	115,432	275	188
*W3FOE	"	48,614	151	109
***NJ3K**	**14**	**200,376**	**359**	**264**
***W3CP**	**7**	**150,002**	**219**	**179**
WC4E	**A**	**4,203,910**	**2334**	**710**
K4BAI	**A**	**2,164,428**	**1523**	**588**
NW6S	**A**	**1,924,773**	**1277**	**587**
K4LTA	"	1,514,114	1239	518
K4VV	"	764,845	685	415
N4CU	"	6,468	54	49
KE4OAR	"	4,141	44	41
NJ8J	"	540	15	15
N4BP	**28**	**1,297,890**	**1084**	**513**
K4WI	"	659,839	737	379
NV4X	"	16,235	112	85
			(Op: W4ZV)	
WW4T	**21**	**2,449,062**	**1484**	**682**
			(Op: N4PN)	
K4OAQ	**21**	**2,112,000**	**1322**	**600**
WW4RR	**21**	**1,307,028**	**1009**	**516**
			(Op: N4ZZ)	
KT3Y	**14**	**2,810,440**	**1611**	**680**
***N4IG**	**A**	**1,548,870**	**1128**	**510**
***WD4AHZ**	**A**	**1,150,256**	**978**	**464**
***N8LM**	**A**	**697,502**	**694**	**386**
*K4FPF	"	671,610	625	366
*K4UVT	"	331,078	430	298
*KG4BIG	"	329,412	496	291
*WA4IMC	"	321,186	451	269
*KS4XG	"	259,182	399	238
*N4UH	"	227,445	367	257
*AA4KD	"	211,167	360	243
*W4NTI	"	80,025	203	165
*N4MM	"	55,878	152	134
*K6ETM	"	49,532	159	122
*W4ATL	"	27,666	121	106
*W4TYU	"	19,847	107	89
*W4TDB	"	16,150	93	85
*KS4YX	"	7,497	55	51
*K4UK/M	"	1,425	25	25
*KV4DJ	"	392	14	14
***KN4Y**	**28**	**213,720**	**419**	**260**
*KA2DIV	"	48,580	167	140
			(Op: N4GM)	
***W4OGG**	**14**	**2,670**	**30**	**30**
***N4NX**	**7**	**255,045**	**322**	**245**
N5RZ	**A**	**4,743,895**	**2434**	**767**
KZ5D	**A**	**2,530,107**	**1681**	**657**
K5RX	**A**	**2,200,386**	**1443**	**606**
W5WMU	"	2,012,528	1405	604
N5PO	"	1,822,504	1293	557
N6ZZ	"	1,262,136	1017	516
W5YM	"	958,562	918	466
			(Op: AC5RR)	
W5TM	**21**	**2,610,951**	**1512**	**707**
			(Op: W5AO)	
W5KL	"	32,960	111	103
K2BA	**14**	**498,180**	**598**	**361**
***WQ5L**	**A**	**2,845,774**	**1735**	**653**
			(Op: N5FG)	
***WD5K**	**A**	**1,760,730**	**1330**	**570**
***K5HP**	**A**	**1,032,750**	**998**	**459**
*NN5T	"	333,809	464	301
*AF5Z	"	246,220	406	260
*NO5W	"	85,510	254	170
*K5HDU	"	53,669	156	119
*N5IW	"	35,880	167	120
*AJ4F	"	30,525	134	111
*AC5SU	"	10,024	61	56
***KØCIE**	**28**	**20,384**	**105**	**91**
***KY5N**	**21**	**621,712**	**629**	**427**
***N5DO**	**7**	**237,820**	**314**	**220**
NE6N	**A**	**5,931,198**	**2738**	**819**
			(Op: N6RT)	
N6MJ	**A**	**5,847,625**	**2680**	**815**
AE6Y	**A**	**2,905,728**	**1709**	**644**
W6TK	"	1,402,452	1099	489
AD6E	"	764,456	750	374
KI6T	"	705,320	729	385
K6HRT	"	245,340	380	261
AI6V	"	158,414	312	206
			(Op: K6GT)	
KT6RU	"	119,448	261	189
			(Op: N6BZA)	
N6NF	"	107,916	294	204
W6ISQ	"	73,315	160	155
K6CTA	"	51,544	179	136
AJ6V	"	19,530	127	93
K6ZM	"	3,700	40	37
			(Op: W7SW)	
WA6O	**21**	**2,056,236**	**1381**	**637**
WY6K	**21**	**1,327,860**	**1038**	**540**
AC6H	"	11,627	87	77
K3EST	**14**	**2,261,124**	**1441**	**642**
AC6DD	"	453,747	552	357
AEØM/6	**7**	**523,053**	**530**	**267**
***NX6T**	**A**	**1,264,572**	**1104**	**486**
			(Op: K6AM)	
***AA6PW**	**A**	**1,228,250**	**1066**	**425**
***WN6K**	**A**	**838,530**	**933**	**385**
*WM6A	"	735,702	755	426
			(Op: K6TA)	
*W6NKR	"	321,735	426	267
*WDØAVV	"	302,768	490	298
*AA6EE	"	156,305	309	215
*N6EM	"	97,252	217	164
*WO6M	"	85,852	270	169
*N6GL	"	82,450	263	170
*AD6G	"	74,250	247	150
*ND6E	"	68,452	181	157
*K6CSL	"	31,350	134	110
*W6VNR	"	20,296	92	86
*K6RO	"	16,235	114	85
*K6LDX	"	11,900	74	70
***WD6DX**	**28**	**12,880**	**85**	**70**
*WA7BNM	"	6,820	62	55
***W6YJ**	**21**	**116,622**	**251**	**209**
*AJ6AA	"	28,050	136	110
***WR6WR**	**14**	**20,503**	**127**	**101**
***KU6T**	**7**	**10,089**	**61**	**59**
AI7B	**A**	**3,799,118**	**1947**	**691**
			(Op: W7GG)	
K7ABC	**A**	**3,588,264**	**2073**	**732**
			(Op: K6LL)	
KC7V	**A**	**3,362,100**	**1841**	**700**
K7NV	"	2,960,958	1693	609
W7QN	"	502,152	652	366
WZ7ZR	"	217,165	495	257
			(Op: W7ZR)	
W7WW	"	171,158	349	227
AK7O	"	12,789	102	87
W7AYY	**21**	**2,552**	**30**	**29**
W8AEF	**3.5**	**26,076**	**110**	**82**
***KN7Y**	**A**	**1,588,248**	**1198**	**516**
***N7IF**	**A**	**266,000**	**421**	**266**
***W7HS**	**A**	**221,534**	**322**	**257**
*WS7V	"	191,444	325	229
*N3AIU	"	176,225	520	265
*W7YAQ	"	138,929	238	223
*KS7T	"	133,127	253	191
*KX7J	"	95,634	223	198
*NA7R	"	30,747	158	111
*W7YS	"	18,785	100	85
***KW7R**	**28**	**10,948**	**79**	**68**
***K7ON**	**21**	**252,008**	**422**	**289**
***AB7RW**	**14**	**502,539**	**588**	**381**
N9AG	**A**	**2,939,916**	**1678**	**651**
ND5S	**A**	**2,188,914**	**1389**	**633**
K8OQL	**A**	**1,791,504**	**1236**	**572**
K8MR	"	100,571	226	163
KT8X	**14**	**29,784**	**115**	**102**
W8ZA	"	17,175	79	75
AA8U	**3.5**	**2,436**	**31**	**29**
***NZ8O**	**A**	**1,748,960**	**1291**	**544**
			(Op: W8MJ)	
***K5IID**	**A**	**1,023,271**	**909**	**449**
***K8GT**	**A**	**517,624**	**537**	**356**
*W8VE	"	268,640	474	292
*NS8O	"	221,656	328	269
*KC8FXR	"	140,964	293	204
*K8CV	"	131,036	249	188
*W8TWA	"	40,657	128	109
*W8IQ	"	26,663	102	91
*W8PN	"	8,400	62	60
***W8UMR**	**14**	**141,440**	**250**	**221**
***KV8Q**	**7**	**249,996**	**425**	**251**
WI9WI	**A**	**1,501,522**	**1215**	**521**
K9UQN	**A**	**451,548**	**514**	**339**
K9NW	**21**	**2,818,244**	**1594**	**676**
***N4TZ/9**	**A**	**1,977,330**	**1319**	**570**
***W9OP**	**A**	**717,808**	**712**	**406**
***WT9U**	**A**	**343,962**	**536**	**291**
*K9BG	"	300,030	426	274
*KJ9C	"	216,177	320	241
*W9CM	"	9,548	80	62
*KE9EX	"	1,064	19	19
***W9ILY**	**21**	**101,528**	**225**	**196**
***K9QVB**	**14**	**1,257,844**	**1015**	**538**
*K9GY	"	102,800	227	200
***K9CJ**	**7**	**19,436**	**100**	**86**
KØOU	**A**	**2,530,467**	**1619**	**629**
KØRF	**A**	**2,290,155**	**1468**	**595**
			(Op: N4VI)	
KØCAT	**A**	**1,569,155**	**1141**	**535**
			(Op: K9WIE)	
WØTT	"	708,587	751	407
KTØR	"	541,914	638	362
K2VV	**14**	**2,197,345**	**1457**	**653**
***WØETT**	**A**	**1,131,894**	**968**	**486**
***KØBX**	**A**	**210,202**	**327**	**227**
*NEØP	"	179,200	387	224
*KØRY	"	161,240	281	232
***KØBCN**	**14**	**50,960**	**182**	**140**

JAMAICA

K6XX/6Y5	**A**	**92,568**	**188**	**152**

BAHAMAS

***C6AKA**	**A**	**3,030,560**	**1800**	**611**
			(Op: DL7VOG)	
***W7DRA/C6A**	**7**	**42,770**	**104**	**91**

CUBA

***CO8LY**	**A**	**435,420**	**557**	**295**
***CO8ZZ**	**3.5**	**9,540**	**53**	**45**

PANAMA

***HP1AC**	**21**	**232,960**	**337**	**260**

PUERTO RICO

***WP4LNY**	**21**	**5,705**	**51**	**46**

COSTA RICA

***TI2WGO**	**21**	**924,912**	**918**	**432**

CANADA

VA3UZ	**A**	**5,640,674**	**2547**	**754**
VE2ZP	**A**	**4,852,304**	**2348**	**692**
VE7QO	**A**	**200,184**	**322**	**228**
VE3BMV	**21**	**3,367,964**	**1758**	**692**
VA7RR	**14**	**3,242,172**	**1811**	**691**
VE7XR	"	1,848,244	1157	586
VE3KZ	**14**	**1,845,337**	**1180**	**589**
VO1MP	**14**	**817,289**	**803**	**389**
VE6EX	**14**	**352,032**	**498**	**304**
***VE3EJ**	**A**	**4,183,200**	**2025**	**672**
***VE9DX**	**A**	**3,623,001**	**1714**	**717**
***VE2AWR**	**A**	**1,318,590**	**1017**	**441**
***VE7XF**	**A**	**829,730**	**762**	**397**
***VE5SF**	**A**	**768,552**	**730**	**372**
*VA7DX	"	765,762	701	358
*VE3IAY	"	754,236	694	369
***VE4YU**	**A**	**367,172**	**448**	**299**
*VE4COZ	"	237,656	336	244
*VE6ZT	"	187,902	300	219
*VE2FFE	"	25,491	103	87
***VE3STT**	**28**	**19,197**	**88**	**81**
***VE7SV**	**28**	**6,664**	**56**	**49**
***VA6DXR**	**28**	**1,071**	**21**	**21**
			(Op: VE7AV)	
*VE6BMX	"	980	20	20
***VC6X**	**21**	**1,735,250**	**1186**	**550**
			(Op: VE6JY)	
***VE3MQW**	**21**	**315,590**	**388**	**302**
***VE7VF**	**21**	**143,616**	**262**	**204**
***VA3SY**	**14**	**686,140**	**667**	**406**
***VE6JY**	**14**	**619,752**	**704**	**372**
			(Op: VE7AV)	
***VY2MGY/3**	**1.8**	**2,262**	**29**	**29**

TURKS & CAICOS

***VP5GA**	**A**	**5,204,328**	**2605**	**678**
			(Op: N2GA)	

MEXICO

***XE1RGL**	**7**	**183,150**	**253**	**165**

CAYMAN IS.

ZF1A	**A**	**4,732,894**	**2529**	**713**
			(Op: W5ASP)	

AFRICA

TUNISIA

3V8BB	**A**	**11,415,184**	**3930**	**821**
			(Op: YT1AD)	

MADAGASCAR

5R8FU	**28**	**9,296**	**56**	**56**

MADEIRA IS.

CT3KN	**A**	**3,143,598**	**1700**	**537**
***CT3/DL3KWR**	**A**	**14,430**	**75**	**65**
***CT3/DL3KWF**	**14**	**6,660**	**51**	**45**

CANARY IS.

EA8ASJ	**21**	**378,378**	**446**	**273**
***AM8DY**	**A**	**152,570**	**241**	**190**
*AN8AXS	"	89,700	200	150

AFRICAN ITALY

***IH9/OL5Y**	**A**	**5,455,393**	**2461**	**667**

EGYPT

***SU9ZZ**	**A**	**7,295,574**	**3067**	**726**

MALI

TZ6DX	**A**	**2,229,735**	**1392**	**529**
			(Op: K4RB)	

SOUTH AFRICA

***ZSØE**	**A**	**100,204**	**202**	**164**
			(Op: ZS6AJS)	
***ZS5RON**	**28**	**50,264**	**140**	**122**
***ZS6MG**	**7**	**185,256**	**193**	**166**

ASIA

VIETNAM

***3W7CW**	**A**	**859,812**	**1118**	**411**
			(Op: SP5AUC)	

AZERBAIJAN

4K9W	**A**	**116,202**	**213**	**181**

ISRAEL

***4Z5FW**	**21**	**268,800**	**400**	**240**
***4Z5AX**	**7**	**814,540**	**511**	**293**

CYPRUS

P3A	**A**	**10,090,962**	**3803**	**833**
			(Op: RZ9UA)	
C4A	**A**	**9,436,716**	**3619**	**783**
			(Op: 5B4ADA/9A3A)	
5B4/RA9JX	**28**	**2,715,866**	**1692**	**599**
5B4/RW9UP	**21**	**3,070,419**	**1755**	**627**

KUWAIT

9K9C	**A**	**1,082,908**	**889**	**388**
			(Op: 9K2/OK1TYM)	

WESTERN MALAYSIA

***9M2TO**	**A**	**1,384,848**	**1312**	**472**
***9M2JI**	**21**	**341,210**	**547**	**298**

SINGAPORE

***9V1XE**	**7**	**39,780**	**101**	**90**
			(Op: VK3DXI)	

TAIWAN

BV7FF	**21**	**322,320**	**582**	**316**

PEOPLE'S REP. OF CHINA

BA4EG	**14**	**108,592**	**364**	**176**
***BD4ED**	**A**	**2,734,164**	**1826**	**636**

KYRGYSTAN

EX2X	**21**	**1,039,182**	**892**	**453**
***EX2A**	**21**	**136,881**	**250**	**201**

KOREA

***HL5UOG**	**A**	**330,600**	**498**	**290**
***HL5AP**	**A**	**192,015**	**330**	**255**
*HL1/JL1EFP	"	164,268	255	162
*HL5BUV	"	37,278	138	109

JAPAN

JH5FXP	**A**	**5,031,026**	**2396**	**718**
JH4UYB	**A**	**4,656,738**	**2241**	**699**
JN2AMD	**A**	**2,673,356**	**1556**	**614**
JA6GCE	"	2,574,988	1627	598
JQ6NAW	"	2,425,608	1539	571
JI2KVW	"	2,045,025	1324	549
JA1JKG	"	1,676,499	1164	503
JA6ACZ	"	1,102,608	781	558
JA2ZJW	"	705,364	694	374
			(Op: JH2CMI)	
JR3NZC	"	539,760	584	346
JA1HP	"	506,528	567	352
JA3ARM	"	451,484	496	331
JA2AXB	"	349,554	429	298
JR1LEV	"	219,736	328	242
JA1NLX	"	153,720	276	210
JA1HHU	"	107,439	235	177
JA6BGA	"	101,592	208	166
JA2QVP	"	70,890	180	139
JA5AIQ	"	52,904	141	136
JA3DAY	"	33,681	111	109
JN7OJA	"	16,133	81	73
JL1DUU	"	207	9	9
JH7XGN	**28**	**156,288**	**308**	**222**
JR7RJZ	"	14,160	89	80
JA1XEM	"	2,100	33	30
JH1AEP	**21**	**2,170,800**	**1310**	**603**
JF1SQC	**21**	**623,200**	**622**	**380**
JA2VOF	"	203,412	301	253
JA2FSM	"	36,621	117	117
JJ1JRH	"	11,840	80	74
JF2FIU	"	4,653	47	47
JH1BUB	"	3,094	39	34
JA9CWJ	**14**	**539,936**	**550**	**359**
JI7NUF	**14**	**518,148**	**602**	**333**
JA5APU	"	419,733	481	313
JR3WXA	"	337,032	435	302
JK1LUY	"	38,533	119	113
JE2HVC	**7**	**39,432**	**103**	**93**
***JH6OPP**	**A**	**1,538,012**	**1125**	**532**
***JA6ZLI**	**A**	**1,503,990**	**1136**	**510**
***JH1AZO**	**A**	**1,412,990**	**1039**	**505**
*JQ1UXN	"	1,403,047	1023	487
*JF2QNM	"	1,223,125	998	475
*JE1REU	"	1,113,915	935	473
*JE4MHL	"	888,731	816	421
*7K4GUR	"	758,205	653	415
*JN1NOP	"	732,204	725	387
*JP6GQN	"	669,762	597	471
*JA2IU	"	666,159	608	377
*JH5OXF	"	648,976	656	376
*JG3LGD	"	565,064	576	332
*JHØIXE	"	535,744	590	352
*JK1ASO	"	531,126	617	342
*JJ3TBB	"	449,904	581	312
*JR4PMX/1	"	437,574	513	313
*JN3SAC	"	413,400	503	312
*JA5ATN	"	410,868	485	303
*JA1XRH	"	382,634	490	302
*JA2OJ	"	350,428	452	293
*JQ3UDL	"	348,992	441	287
*JF2SKV	"	254,980	444	244
*JA7DNO	"	228,661	353	251
*JH2NWP	"	220,248	369	252
*JQ2FFS	"	216,000	356	225
*JR5EHB	"	210,693	346	237
*JG1OWV	"	202,086	319	206
*JH7CJM	"	187,224	274	232
*JA1PS	"	182,810	291	202
*JJ1QJP	"	172,000	300	215
*JS1PWV	"	153,846	303	198
*JE4VRF	"	138,502	273	182
*JA2BQX	"	132,830	259	185
*JA1KI	"	130,743	259	199
*JH1PXY	"	125,216	247	172
*JP1SRG	"	118,469	239	169
*JH1JGZ	"	100,160	229	160
*JE5XIC	"	98,154	244	171
*JA6SRB/4	"	95,654	210	169
*JR3NDM	"	75,152	202	154
*JFØFOH	"	66,816	164	128
*JR7OMD	"	61,248	180	132
*JA1XPU	"	46,065	159	111
*JA1BBA	"	45,008	141	116
*JN7LYD	"	34,775	129	107
*JA3RK	"	34,093	120	103
*JA1MXY	"	32,922	122	93
*JA4AOR	"	27,265	104	95
*JE8KKX	"	18,009	101	87
*JA9KUG	"	10,140	57	52
*JA7ARW	"	8,305	61	55
*JO7BBS	"	8,140	60	55
*JF7GDF	"	6,615	51	49
*JF7DXT	"	4,617	65	27
*JI2VLM	"	4,366	50	37
*JN1UEP/4	"	3,811	38	37
*JA3WFQ	"	3,135	35	33
*JA6QDU	"	645	16	15
*JG1FGL	"	507	13	13
*JG1BUG	"	450	11	10
***JH9VSF**	**28**	**287,922**	**421**	**282**
***JF3BFS**	**28**	**240,504**	**383**	**264**
*JE2SOY	"	43,810	151	130
*JA4ETH	"	32,832	132	114
*JA1AAT	"	3,744	40	39
*7K1EQG	"	3,268	45	38
*7K2PBB	"	300	13	12
*JL3IVX	"	126	7	7
***JGØOXL**	**21**	**477,456**	**520**	**348**
***JJ1NZA**	**21**	**230,892**	**329**	**271**
*JJ1GQH	"	214,797	312	253
*JM2RUV	"	200,912	314	232
*JJ6TWQ	"	177,870	305	242
*JR7CJO	"	159,075	265	225
*JA4BAA	"	140,964	267	204
*JA3HC	"	114,723	227	189
*JG3NKP/1	"	109,440	218	192
*JA2DHL	"	37,962	125	114
*JM1KNI	"	27,742	102	97
*JJ2SHW	"	216	10	8
*JA5IDV	"	40	4	4
***JHØEPI**	**14**	**666,536**	**668**	**377**
*JE4QGF	"	88,704	200	176
*JH2OMM	"	85,020	205	156
*JK1AFI	"	15,264	76	72
***JM1NKT**	**7**	**132,600**	**242**	**150**
*JI7OED	"	42,534	140	102
***JE1SPY**	**1.8**	**90**	**10**	**9**

TURKEY

***TA3BN**	**A**	**23,940**	**101**	**84**
***YM3D**	**21**	**2,823,786**	**1703**	**614**

ASIATIC RUSSIA

UAØJDD	**A**	**56,146**	**183**	**134**
RVØAR	"	5,978	51	49
RNØA	**21**	**2,902,068**	**1652**	**702**
			(Op: UAØAGI)	
RSØF	**21**	**1,654,236**	**1260**	**578**
			(Op: UAØFZ)	
UAØJQ	"	1,653,435	1145	609
***RUØLL**	**A**	**1,506,291**	**1388**	**487**
*UAØLS	"	245,000	342	245
***RWØLZ**	**28**	**91,043**	**329**	**181**
***RUØSN**	**14**	**1,506,025**	**1137**	**535**
RI9C	**A**	**4,809,352**	**2214**	**664**
			(Op: UA9CDV)	
RZ9IR	**A**	**3,630,690**	**1862**	**630**
UA9CLB	**A**	**3,421,632**	**1793**	**568**
UA9MA	"	2,147,828	1473	556
RZ9AE	"	1,502,644	953	481
RN9RZ	"	1,410,750	936	450
UA9LAC	"	339,891	419	267
UA9LP	**28**	**147,600**	**284**	**200**
UA9BS	**14**	**110,252**	**223**	**172**
RA9AC	"	29,274	114	102
UA9AM	**7**	**775,838**	**493**	**302**
RA9MC	**3.5**	**175,950**	**216**	**153**
RX9LW	"	150,912	206	144
***RJ9J**	**A**	**3,195,780**	**1689**	**588**
			(Op: RA9JR)	
***RX9FB**	**A**	**2,078,024**	**946**	**754**
***UA9WQK**	**A**	**1,585,100**	**1036**	**484**
*RZ9OU	"	685,233	741	369
*UA9APA	"	511,360	508	340
*UA9YE	"	316,800	392	300
*RA9XF	"	240,393	347	227
*RZ9AWO	"	230,769	394	231
			(Op: UA9AM)	
*UA9XC	"	69,160	180	140
*RW9QA	"	54,145	148	119
*UA9JMS	"	5,203	43	43
***UA9YAB**	**28**	**496,620**	**562**	**356**
*RA9HDM	"	40,741	133	131
*RU9MY	"	28,126	114	98
*UA9OQA	"	24,026	108	82
***UA9AFS**	**14**	**727,983**	**623**	**423**
***UA9MBX**	**3.5**	**84,530**	**149**	**107**
*RK9AY	"	59,508	91	58

KAZAKHSTAN

UPØL	**A**	**5,059,353**	**2368**	**663**
			(Op: UN9LW)	
UP4L	**A**	**4,796,190**	**2239**	**690**
			(Op: UN7LZ)	
UN7LG	**A**	**4,656,528**	**2212**	**648**
UN8FZ	"	508,485	568	311
UPØF	**21**	**985,230**	**900**	**445**
UN7LO	**3.5**	**184,632**	**225**	**157**
			(Op: UN7LT)	
***UP6P**	**A**	**3,145,629**	**1715**	**629**
			(Op: UN6P)	
***UN8PF**	**A**	**453,921**	**513**	**339**
*UN9LN	"	136,416	252	203
*UNØLG	"	39,600	139	100
***UN4PD**	**21**	**301,080**	**376**	**312**
*UN4PG	"	240,713	345	277

MACAO

***XX9TKW**	**A**	**1,231,254**	**1315**	**453**
			(Op: OH2KW)	

SYRIA

***YI9OM**	**A**	**1,422,360**	**1118**	**439**
			(Op: OM6TX)	

MARITIME MOBILE

***KC7JEF/MMA**		**389,080**	**456**	**284**

EUROPE

CROATIA

9A5Y	**A**	**2,622,480**	**1947**	**669**
			(Op: 9A3LG)	
9A2TN	"	472,320	555	369
9A3HX	**28**	**555,984**	**800**	**432**
9A3GW	**21**	**4,411,860**	**2324**	**834**
9A5W	**14**	**3,213,280**	**2004**	**755**
9AY2K	**7**	**2,308,670**	**1279**	**559**
			(Op: 9A9A)	
9A6A	**3.5**	**416,939**	**604**	**293**
9A2AJ	**1.8**	**125,388**	**296**	**108**
9A4X	**1.8**	**88,976**	**264**	**166**
***9A2NO**	**A**	**1,153,980**	**1122**	**540**
***9A3VM**	**28**	**921,195**	**1157**	**495**
***9A1W**	**3.5**	**64,628**	**209**	**151**

GERMANY

DL3JK	**A**	**2,492,708**	**1918**	**604**
DJ5BV	**A**	**2,374,524**	**1719**	**639**
DFØNF	**A**	**1,691,988**	**1513**	**543**
			(Op: DL8UD)	
DFØFS	"	1,691,637	1635	569
			(Op: DL1EKC)	
DK5AD	"	1,279,260	1222	515
DL4CF	"	1,260,057	1283	527
DF1DV	"	869,085	1005	445
DL4HRM	"	813,722	902	442
DL6AG	"	708,526	867	442
DLØDA	"	496,306	660	398
DJ8UV	"	208,905	457	285
DL1SAN	"	130,759	311	229
DL6UAM	"	123,388	265	218
DL6DVU	"	63,030	234	165
DF5AU	"	1,836	30	27
DL7ZZ	**28**	**903,984**	**1050**	**509**
DJ9DZ	**28**	**862,160**	**962**	**520**
DK3KD	"	536,608	802	409
DKØMM	"	426,620	610	415
			(Op: DJ7IK)	
DL5JAB	"	350,416	580	362
DK7AN	"	47,558	177	158
DL2HUM	"	3,520	44	44
DL7VMM	**21**	**401,555**	**546**	**385**
DL1TH	"	286,062	460	343
DL1JFM	"	65,136	200	184
***DL1MGB**	**A**	**1,359,891**	**1340**	**531**
***DL4SDW**	**A**	**1,021,440**	**1105**	**480**
***DJ1OJ**	**A**	**631,728**	**801**	**428**
*DL2ZAV	"	588,000	848	400
*DL4JYT	"	560,662	813	394
*DL2GBB	"	468,360	660	360
*DL5RMH	"	468,000	505	325
*DK7FP	"	411,804	594	324
*DL1EFD	"	376,988	555	316
*DF5ZV	"	376,532	552	338
*DK9IP	"	305,320	552	340
*DL2RTJ	"	270,160	504	307
*DL2ANM	"	232,560	374	240
*DL3BZZ	"	216,480	384	264
*DK7ZH	"	144,248	315	247
*DJ9MH	"	135,256	324	212
*DL2YAK	"	117,117	306	231
*DL2AL	"	115,089	315	227
*DM3PKK	"	82,644	426	194
*DJ1MM	"	77,080	238	188
*DL8IH	"	74,800	256	187
*DL1IA	"	55,476	190	138
*DJ7IK	"	25,602	115	102
*DL2HBX	"	24,610	118	107
*DL1SBF	"	5,394	65	58
*DJ5NN	"	4,650	62	31
***DL7BY**	**28**	**344,416**	**588**	**376**
***DL9NEI**	**28**	**204,006**	**418**	**281**
*DL1FMG	"	40,020	174	145
*DL2AXM	"	13,800	100	100
***DK3DM**	**21**	**543,043**	**674**	**439**
***DJ5GG**	**21**	**418,080**	**536**	**390**
*DL1EMH	"	310,218	480	347
***DL6UBF**	**14**	**731**	**17**	**17**
***DJ2YE**	**7**	**106,506**	**225**	**183**

SPAIN

AN5FV	**A**	**4,195,620**	**2660**	**780**
AN5YU	**A**	**1,690,160**	**1530**	**571**
EA7TG	**A**	**1,001,888**	**1068**	**524**
AN1FBU	"	413,910	699	365
EA1EQ	"	381,480	669	340
AN5DCL	"	191,048	380	286
EA1BAE	"	145,680	403	240
EA7MT	"	84,912	240	183
EC5AID	"	30,290	148	130
EA5WU	**21**	**1,841,856**	**1484**	**636**
***AN2BNU**	**A**	**870,226**	**1071**	**427**
***EA4BWR**	**A**	**772,920**	**610**	**339**
***EA5FID**	**A**	**708,964**	**800**	**421**
*EA4BSC	"	395,530	533	370
*AN2BDS	"	387,185	690	367
*EA3GIP	"	370,058	527	331
*AM3ALV	"	215,305	389	289
*EA7FZ	"	97,566	255	202
*EA1FBJ	"	89,688	282	202
*EA4CIE	"	67,643	212	173
*AN7CA	"	32,130	144	119
*AN1CBX	"	10,725	78	65
*EA4ABP	"	2,944	64	46
*EA1WX	"	792	18	18
***AM5DWS**	**28**	**872,217**	**1219**	**487**
*AN7AKJ	"	351,820	652	359
*EA1EXE	"	60,273	240	181
***AN7ASZ**	**14**	**494,500**	**677**	**430**
*AN3CT	"	232,170	516	327
*EA1ND	"	22,344	140	114
***EA2AZ**	**3.5**	**53,862**	**183**	**141**

BALEARIC IS.

***AN6ZS**	**A**	**83,079**	**181**	**153**
*EA6/PA3HBI	"	18,260	133	110

IRELAND

***EI4DW**	**A**	**472,500**	**561**	**375**
***EI8GP**	**21**	**172,062**	**333**	**242**

MOLDAVIA

ER/UT7ND	**A**	**4,075,500**	**2674**	**715**
ER1CW	**7**	**55,860**	**172**	**133**
***ER6A**	**A**	**4,948,640**	**3317**	**785**
			(Op: ER1LW)	

ESTONIA

ES6PZ	**A**	**1,136,484**	**1279**	**459**
ES4RD	**14**	**1,181,400**	**1136**	**537**
***ES6CO**	**28**	**43,977**	**151**	**137**
***ES1CN**	**21**	**287,858**	**555**	**381**

BELARUS

EU1MM	**A**	**2,803,526**	**1988**	**706**
EU1DX	**A**	**1,993,476**	**1593**	**613**
EU1SA	**A**	**1,390,275**	**1380**	**555**
EW2AA	"	567,742	778	379
EW2EG	**7**	**36,897**	**153**	**123**
***EU1PA**	**A**	**1,159,344**	**1217**	**498**
***EW1EA**	**A**	**405,840**	**600**	**356**
***EW8OS**	**21**	**199,826**	**372**	**293**
***EW1MN**	**14**	**204,815**	**391**	**299**
*EW4EW	"	92,736	236	207
***EU6DX**	**1.8**	**242**	**11**	**11**

FRANCE

F6HKA	**A**	**2,272,428**	**1889**	**636**
F6DKV	"	233,856	497	288
F5RZJ	**28**	**854,343**	**978**	**497**
F8BPN/P	**28**	**541,198**	**875**	**406**
F5NBX	**21**	**2,152,260**	**1547**	**660**
***F5JBR**	**A**	**1,481,799**	**1356**	**541**
***F8CRH**	**A**	**1,069,872**	**1132**	**496**
***F5NQL**	**A**	**670,329**	**900**	**407**
*F5ICC	"	615,825	716	391
*F5PBL	"	334,855	569	347
*F6OIE	"	238,602	540	299
*F5SGI	"	165,984	386	247
*F6JSZ	"	114,000	320	228
*F5JOT	"	95,545	262	197
*F6CXJ	"	57,456	200	171
*F5NLX	"	52,572	214	156
***F6IIE**	**28**	**171,086**	**443**	**262**
*F8AWQ	"	102,765	281	221
*F8PDR	"	79,328	304	148
*F8CNR	"	31,232	163	128
***F/OK1EE**	**7**	**734,187**	**799**	**381**

ENGLAND

M5X	**A**	**5,221,820**	**3058**	**785**
			(Op: G4TSH)	
G5LP	**A**	**1,840,360**	**1614**	**556**
G3ZRJ	**A**	**822,206**	**949**	**418**
G3TXF	"	725,424	885	408
G3TMA	"	223,146	419	253
G3UFY	"	171,351	349	237
G4BJM	"	97,465	270	193
G5G	**14**	**1,879,471**	**1530**	**671**
			(Op: GØLII)	
***G3KKQ**	**A**	**602,531**	**792**	**391**
***G3JJZ**	**A**	**536,137**	**696**	**401**
*G3OOU	"	259,974	518	286
*G3VQQ	"	127,866	325	211
*G6QQ	"	126,492	304	254
*G4ZME	"	46,041	171	149
*G3ECS	"	39,116	150	127
***GØMTN**	**28**	**343,387**	**671**	**341**
***M7W**	**21**	**714,844**	**870**	**466**
			(Op: G4IIY)	
***M4T**	**14**	**398,860**	**729**	**385**
			(Op: GØVQR)	

NORTHERN IRELAND

GIØKOW	**21**	**4,141,600**	**2353**	**800**
			(Op: GIØNWG)	
***GI4SNC**	**A**	**336,539**	**700**	**367**

SCOTLAND

***GM3CFS**	**21**	**308,775**	**450**	**345**

GUERNSEY

***MUØFAL**	**A**	**294,752**	**535**	**302**

WALES

***GW3NJW**	**21**	**609,771**	**830**	**439**

HUNGARY

HA8JV	**A**	**3,356,598**	**2261**	**686**
HAØHW	**A**	**2,094,400**	**1714**	**616**
HG4F	**14**	**719,318**	**856**	**457**
			(Op: HA4FF)	
HA8BE	**1.8**	**72,933**	**237**	**151**
***HA8IH**	**A**	**2,148,104**	**1578**	**623**
***HA1CW**	**A**	**2,109,744**	**1811**	**598**
***HA4YF**	**A**	**1,013,796**	**1035**	**486**
*HA/YT7BR	"	408,213	677	351
***HA8RH**	**28**	**849,815**	**1014**	**487**
*HA8YU	"	15,485	104	95
***HG3DX**	**21**	**3,401,287**	**2025**	**769**
			(Op: HA3UU)	
***HA3LN**	**14**	**733,095**	**893**	**495**
*HA6NW	"	341,890	541	358
*HA3GA	"	91,104	300	219
***HA4FV**	**3.5**	**244,524**	**460**	**246**

SWITZERLAND

HB9CIC	**A**	**301,250**	**533**	**250**
HB9FBS	**3.5**	**226,338**	**410**	**238**
***HB9ARF**	**A**	**1,408,144**	**1488**	**527**
*HB2HQX	"	562,380	526	260
***HB2LCW**	**21**	**212,721**	**402**	**291**

ITALY

IK4MTF	**A**	**3,861,097**	**2357**	**727**
IK2AHB	**A**	**585,544**	**774**	**424**
IK2WXV	"	421,400	672	392
I2SVA	"	408,090	564	366
IV3RLB	"	240,526	428	286
IQ5Z	**28**	**47,762**	**202**	**143**
IK7JWY	**21**	**248,930**	**443**	**310**
IO2L	"	229,796	468	283
			(Op: IZ2ACZ)	
IU2C	**14**	**390,775**	**659**	**385**
			(Op: IZ2AHF)	
***IKØYVV**	**A**	**2,714,432**	**1949**	**664**
***IØZUT**	**A**	**1,816,765**	**1591**	**587**
***I3JSS**	**A**	**1,489,992**	**1510**	**543**
*IZØAIS	"	1,051,076	1184	493
*IQ3X	"	377,400	579	340
			(Op: IV3SKB)	
*IZ1ASP	"	200,940	283	197
*IK4UNH	"	155,956	351	254
*IZ1DFI	"	122,264	299	232
*IZØANC	"	113,735	304	215
*IK2WYI	"	105,074	300	214
*IZ2DAY	"	54,720	235	180
*IV3KSE	"	6,890	56	53
*IZ7CDB	"	1,830	31	30
*IZ3ALS	"	416	13	13
***IK2NCF**	**21**	**120,032**	**330**	**242**
***I5OQV**	**7**	**11,296**	**76**	**74**

SARDINIA

ISØ/YO3RA	**7**	**41,006**	**119**	**101**
***ISØIGV**	**A**	**920,568**	**934**	**634**
***ISØHQJ**	**A**	**512,720**	**812**	**377**
*ISØUWX	"	93,825	303	225
***ISØSDX**	**14**	**191,330**	**484**	**265**

SICILY

***IU9AF**	**21**	**1,131,939**	**1231**	**519**
			(Op: IT9AF)	

NORWAY

LA7MFA	**A**	**2,558,074**	**1957**	**631**
LA8WG	"	102,238	314	194
***LA9HFA**	**A**	**1,527,932**	**1614**	**554**
***LA2HFA**	**A**	**627,900**	**562**	**325**
*LA3BO	"	464,202	800	369
*LA1YE	"	266,825	501	325
***LA7AK**	**28**	**34,463**	**210**	**143**

LUXEMBOURG

***LX1JH**	**A**	**66,880**	**220**	**160**

LITHUANIA

LY6M	**A**	**6,332,616**	**3250**	**843**
			(Op: LY1DS)	
LY2IJ	**A**	**3,798,819**	**2478**	**729**

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LY2OX	**A**	**2,778,880**	**2039**	**668**
LY2FN	"	647,164	780	406
LY3GJ	**14**	**13,034**	**108**	**98**
LY6K	**7**	**1,298,700**	**968**	**468**
			(Op: LY3BS)	
LY3BX	"	466,522	536	329
LY3ID	"	446,736	530	328
LY3CW	**3.5**	**279,310**	**466**	**265**
***LY3BA**	**A**	**3,014,620**	**2124**	**706**
***LY2LA**	**A**	**1,831,950**	**1562**	**590**
***LY2BM**	**A**	**1,833,984**	**1629**	**576**
*LY2MW	"	1,646,804	1607	541
*LY2GV	"	1,234,800	1272	504
*LY1BW	"	972,496	1067	457
*LY2DX	"	918,240	1050	480
*LY1DM	"	218,700	376	270
*LY2PBM	"	190,242	465	271
*LY2EC	"	166,332	397	249
*LY2BBF	"	119,664	294	216
*LY2OM	"	107,730	278	210
***LY2AT**	**28**	**97,228**	**300**	**223**
***LY2GW**	**21**	**71,225**	**211**	**185**
***LY2BLQ**	**7**	**365,787**	**508**	**291**

BULGARIA

LZ2PL	**A**	**2,132,627**	**1799**	**613**
LZ1BJ	**A**	**1,539,880**	**1519**	**548**
LZ1QZ	"	587,482	914	406
LZ5QZ	"	33,536	131	131
LZ1MC	**28**	**109,263**	**309**	**231**
LZ7G	**14**	**2,511,528**	**1850**	**681**
			(Op: LZ1NK)	
LZ2RF	**14**	**664,868**	**848**	**463**
LZ2FV	**7**	**903,104**	**770**	**412**
LZ2JA	**3.5**	**75,330**	**225**	**155**
***LZ9A**	**A**	**2,351,106**	**1747**	**631**
			(Op: LZ2JE)	
***LZ1FW**	**A**	**99,792**	**304**	**198**
*LZ2AU	"	48,230	173	130
*LZ1NJ	"	13,224	90	87
*LZ1NG	"	12,663	71	67
*LZ4BU	"	9,540	66	60
*LZ1BG	"	203	7	7
***LZ2GS**	**28**	**185,730**	**383**	**302**
*LZ2MP	"	111,523	303	229
*LZ1QH	"	57,564	184	156
*LZ2DL	"	15,576	96	88
***LZ3YY**	**14**	**995,796**	**1051**	**556**

AUSTRIA

*OE8WED	A	35	5	5

FINLAND

OI5AX	**A**	**3,250,702**	**2338**	**674**
			(Op: OH2JTE)	
OH6NJ	**A**	**2,438,646**	**1826**	**651**
OH3RR	**A**	**849,150**	**960**	**459**
OH2NRG	"	586,688	865	412
OH4RH	"	507,375	736	375
OH5NE	"	210,396	420	267
OH1BOI	"	140,880	312	240
OH5UX	"	328	8	8
OH9MM	**28**	**164,608**	**567**	**256**
OH1F	**21**	**2,821,040**	**1756**	**716**
			(Op: OH1MDR)	
OH5BM	**21**	**2,175,072**	**1530**	**652**
OH3WW	**21**	**1,210,984**	**1071**	**514**
OH9W	**14**	**2,231,829**	**1667**	**657**
			(Op: OH6LI)	
OH8L	**14**	**1,804,208**	**1440**	**623**
			(Op: OH8LQ)	
OH3BU	**14**	**1,151,876**	**1106**	**557**
OH6Y	**7**	**256,824**	**449**	**246**
			(Op: OH6YF)	
OH2W	**3.5**	**334,170**	**515**	**282**
			(Op: OH2BCI)	
OH4MFA	**1.8**	**61,202**	**203**	**142**
***OH8CW**	**A**	**1,644,300**	**1413**	**567**
***OH2CV**	**A**	**639,515**	**804**	**415**
***OH2LYP**	**A**	**488,235**	**734**	**363**
*OH3YM	"	407,508	610	348
*OH2VZ	"	237,987	431	279
*OH6EI	"	92,150	319	190
*OH2FS	"	82,080	189	171
*OH6OS	"	62,328	207	168
*OH7DK	"	57,942	224	174
*OH2BPA	"	51,576	185	168
*OH3TZ	"	24,640	120	112
*OH3KAV	"	5,658	50	46
***OH6XY**	**28**	**35,100**	**162**	**135**
*OH1UP	"	8,833	83	73
***OH5PA**	**14**	**1,403**	**23**	**23**

ALAND IS.

OHØZ	**A**	**7,240,444**	**3702**	**893**
			(Op: LY2TA)	
OHØ/LY2CY	**A**	**1,499,925**	**1586**	**525**
OHØR	"	1,355,781	1265	483
			(Op: OH2TA)	

CZECH REPUBLIC

OK1RF	**A**	**5,605,717**	**2749**	**793**
OL4M	**A**	**1,250,993**	**1293**	**499**
OK2HBR	**A**	**1,037,136**	**1077**	**492**
OK1DWC	"	781,803	1036	477
OK1AVY	"	475,500	662	375
OK2LW	"	414,854	500	346
OK1CRM	"	357,780	583	335
OK2RZ	**28**	**1,465,296**	**1350**	**623**
OK1NI	**28**	**248,625**	**464**	**325**
OK1PG	"	199,178	431	287
OK2BJT	"	186,055	381	293
OK2ABU	"	27,594	219	126
OL5T	**21**	**1,032,750**	**1011**	**510**
			(Op: OK1FLM)	
OK2SAT	**21**	**982,997**	**938**	**541**
OL3E	"	560,880	754	410
			(Op: OK1MBZ)	
OK2SG	"	295,269	444	339
OK5W	**14**	**3,039,434**	**1858**	**761**
			(Op: OK2ZW)	
OK5DX	**3.5**	**496,128**	**598**	**323**
			(Op: OK1TN)	
OK2GZ	**3.5**	**308,580**	**502**	**278**
OK1TP	**1.8**	**30,736**	**146**	**113**
***OK2PP**	**A**	**1,724,157**	**1423**	**573**
***OK1QM**	**A**	**1,662,536**	**1527**	**568**
***OK1BA**	**A**	**1,517,523**	**1228**	**569**
*OK2WTM	"	1,432,730	1330	535
*OK1HX	"	1,345,234	1332	517
*OK1ZP	"	1,200,784	1122	502
*OK2EC	"	1,059,735	1066	465
*OK2HI	"	1,036,782	1100	482
*OK2HIJ	"	707,850	823	429
*OL5TEN	"	581,808	803	391
			(Op: OK1JN)	
*OK1GS	"	423,568	538	368
*OK1DSZ	"	389,200	558	350
*OK1AYY	"	350,080	550	320
*OK2VWB	"	332,937	490	297
*OK1DVK	"	322,653	408	821
*OK1FHP	"	221,265	425	297
*OK1WWJ	"	211,312	430	281
*OK2BNC	"	203,688	404	246
*OK1TD	"	198,476	324	236
*OK1FCA	"	191,201	379	263
*OK2ON	"	190,816	400	268
*OK1FWW	"	174,947	394	251
*OK1HCG	"	174,510	463	277
*OK2PKY	"	161,230	313	230
*OK2SWD	"	138,229	297	217
*OK2VP	"	101,860	275	220
*OK2AJ	"	91,915	300	155
*OK2ZJ	"	53,940	200	155
*OK2ZV	"	29,344	131	112
*OK1AOU	"	24,045	140	105
*OK2BJ	"	15,768	90	73
*OK2BHE	"	938	19	14
*OK2OBW	"	645	16	15
			(Op: OK2ZV)	
*OK2KRK	"	624	17	16
			(Op: OK2ZV)	
***OK8ANM**	**28**	**383,680**	**624**	**352**
***OK1AES**	**28**	**261,784**	**437**	**344**
*OK1EW	"	259,292	517	332
*OK1XC	"	144,434	329	257
*OK2BNO	"	37,620	150	132
*OK2PCL	"	36,966	141	122
***OK2QX**	**21**	**594,949**	**684**	**443**
***OK2HZ**	**21**	**352,404**	**0**	**351**
*OK2QA	"	75,030	223	183
*OK1FTW	"	17,680	89	80
*OK1JDJ	"	8,585	85	60
***OK2PBG**	**14**	**64,260**	**182**	**153**
***OK1SI**	**3.5**	**193,734**	**395**	**229**
***OK1FNJ**	**3.5**	**145,950**	**314**	**210**
*OK1HGM	"	97,916	263	182
***OK2SNX**	**1.8**	**44,268**	**184**	**124**
*OK1DKM	"	2,140	62	20

SLOVAKIA

OM3CND	**A**	**968,836**	**1065**	**454**
OM3A	**28**	**1,033,188**	**1190**	**537**
			(Op: OM3CGN)	
OM2TB	"	6,780	61	60
OM5M	**21**	**3,105,288**	**1916**	**731**
			(Op: OM3BH)	
OM3A	**21**	**2,978,909**	**1841**	**739**
			(Op: OMØWR)	
OM3NA	**14**	**2,372,832**	**1625**	**672**
***OM6T**	**A**	**3,060,540**	**2179**	**694**
			(Op: OM5AW)	
***OM4DN**	**A**	**775,200**	**1002**	**425**
***OM4TX**	**A**	**655,316**	**893**	**419**
*OM7AG	"	424,359	711	351
*OM7PY	"	304,520	510	331
*OM1AF	"	236,328	432	258
*OM8ON	"	200,860	340	242
*OM7VF	"	194,636	406	247
*OM8MM	"	161,915	351	235
***OM6AMZ**	**28**	**19,780**	**129**	**92**
***OM5AR**	**21**	**254,058**	**454**	**322**
*OM4WW	"	225,031	388	307
***OM3CDN**	**14**	**85,470**	**260**	**210**
*OM2EE	"	24,888	161	122
*OM3TU	"	13,284	123	108
***OM1AW**	**3.5**	**26,728**	**0**	**104**

BELGIUM

ON4CAS	**A**	**159,803**	**363**	**259**
***OTØA**	**A**	**1,874,291**	**1648**	**587**
			(Op: JK3GAD)	
***ON5UM**	**A**	**1,423,292**	**1318**	**542**
***ON4XG**	**A**	**513,216**	**718**	**396**
***ON6CW**	**21**	**560,541**	**703**	**390**

FAROE IS.

OY1CT	**A**	**731,178**	**1142**	**441**

DENMARK

OZ5MJ	**A**	**381,980**	**550**	**355**
***OZ8AE**	**A**	**1,677,665**	**1394**	**605**
***5P1ER**	**A**	**1,167,360**	**1386**	**512**
			(Op: OZ1AA)	
*OZ5EDR	"	431,676	756	378
			(Op: OZ1HET)	
*OZ5UR	"	55,748	202	154

THE NETHERLANDS

PA1BX	**A**	**72,068**	**253**	**172**
PA5ET	**28**	**1,132,625**	**1235**	**533**
***PA3ELD**	**A**	**864,232**	**1037**	**472**
***PAØJR**	**A**	**699,125**	**799**	**425**
***PA3AAV**	**A**	**312,960**	**527**	**320**
*PA3EMN	"	267,890	530	301
***PAØMIR**	**21**	**300,468**	**464**	**343**
***PAØRRS**	**21**	**191,187**	**365**	**291**
*PA1MRK	"	25,376	122	122
***PAØJED**	**14**	**72,446**	**210**	**178**
***PA6F**	**14**	**50,904**	**201**	**168**
			(Op: PA4GF)	

SLOVENIA

S57DX	**A**	**4,579,850**	**2550**	**757**
S59A	**A**	**4,195,256**	**2323**	**754**
S56R	**A**	**3,654,477**	**2295**	**729**
			(Op: S53R)	
S5ØØU	"	3,381,126	2125	722
			(Op: S53O)	
S58WW	"	2,092,512	1718	614
S55A	"	1,871,253	1630	589
S51F	**28**	**1,366,008**	**1328**	**564**
S57AW	**21**	**3,608,372**	**2083**	**764**
S5A	**21**	**2,896,412**	**1856**	**718**
			(Op: S5ØA)	
S57AL	**7**	**1,494,480**	**964**	**479**
S52O	**7**	**1,154,440**	**837**	**434**
S57M	**1.8**	**95,691**	**279**	**167**
***S57J**	**A**	**2,606,245**	**1800**	**655**
***S59AA**	**A**	**2,579,373**	**1948**	**619**
***S59KW**	**A**	**1,486,562**	**1482**	**539**
*S58MU	"	724,890	815	438
*S57NPR	"	56,784	222	169
***S58DX**	**28**	**460,512**	**700**	**416**
***S5ØØS**	**21**	**1,646,791**	**1315**	**607**
			(Op: S5ØB)	
*S51WA	"	341,136	478	368
***S58AL**	**14**	**2,004,078**	**1498**	**633**
***S54A**	**7**	**779,945**	**715**	**401**
***S53F**	**7**	**697,230**	**713**	**381**
***S57U**	**3.5**	**259,056**	**454**	**257**

SWEDEN

SM2T	**A**	**1,744,028**	**1573**	**572**
			(Op: SM2EZT)	
SM6WQB	**A**	**341,682**	**575**	**334**
SM3R	"	315,948	512	339
			(Op: SM3CBR)	
SM7EH	"	216,186	402	274
SM7BVO	"	203,850	411	270
8SØA	**28**	**476,684**	**896**	**412**
			(Op: SMØDJZ)	
8S3G	**21**	**3,169,262**	**2058**	**718**
			(Op: SMØGNU)	
SI3SSA	**21**	**1,294,850**	**1154**	**551**
			(Op: SM3WMV)	
SMØKV	"	8,364	70	68
SK3W	**3.5**	**239,554**	**440**	**241**
			(Op: SMØOEK)	
***SM6BSK**	**A**	**676,928**	**803**	**448**
***SM2KAL**	**A**	**422,066**	**824**	**383**
*SM5BRG	"	402,595	618	365
*SM3AVW	"	318,502	557	326
*8S6A	"	196,710	440	249
			(Op: SM6DPF)	
*7SØZ	"	189,280	500	280
			(Op: SMØNZZ)	
*SM6DER	"	155,999	362	257
*SM7BJW	"	136,749	336	237
*SMØBDS	"	107,877	251	231
*8SØW	"	80,685	210	163
			(Op: SMØNJO)	
*SM7ATL	"	45,440	185	142
***SM5IMO**	**28**	**206,150**	**451**	**310**
***SM5G**	**28**	**202,707**	**502**	**303**
***SM4SX**	**21**	**214,328**	**380**	**292**
***SM6N**	**14**	**330,242**	**607**	**374**
			(Op: SM6NJK)	
***SI9AM**	**14**	**243,110**	**505**	**302**
			(Op: SM3WMU)	
***7S2E**	**3.5**	**63,980**	**211**	**140**
			(Op: SM2DMU)	

POLAND

SP7GIQ	**A**	**5,551,139**	**2742**	**803**
SP3HRN	**A**	**1,441,775**	**1308**	**505**
SP9LAS	"	50,050	195	154
SP5OXJ	"	1,128	25	24
SP9DGO/P	**28**	**2,077**	**31**	**31**
SN4JWR	**14**	**1,505,602**	**1273**	**602**
SN7N	**14**	**1,474,155**	**1363**	**615**
			(Op: SP7NMW)	
SP5GH	**3.5**	**152,721**	**220**	**213**
***SN2A**	**A**	**2,111,100**	**1717**	**620**
***SP4TKR**	**A**	**984,227**	**1183**	**487**
***SQ2HEB**	**A**	**513,240**	**721**	**364**
*SP1AEN	"	484,866	704	369
*SP8FHJ	"	335,016	577	324
*SP9GKM	"	300,186	530	306
*SP5ICS	"	221,730	465	285
*SP3VT	"	213,192	419	282
*SQ9CAQ	"	180,072	414	244
*SP3XR	"	107,156	237	178
*SP9IL/P	"	62,868	186	169
*SP9KJM	"	61,540	182	170
*SQ4NR	"	26,700	108	89
*SP9KJU	"	23,220	133	108
			(Op: SP9MDY)	
*SP6BEN	"	8,618	67	62
***SQ9HYM**	**28**	**285,272**	**584**	**338**
***SP3GTS**	**28**	**117,572**	**301**	**238**
*SN9R	"	58,562	221	178
			(Op: SP9BRP)	
*SP5LCC	"	10,579	71	71
***3Z9XCN**	**21**	**1,147,733**	**1107**	**551**
***SP9ADV**	**21**	**83,848**	**215**	**188**
*SP6TRH	"	16,920	102	94
*SP5CGN	"	9,452	69	68
*SP6DHH	"	8,540	83	70
***3Z8BAB**	**14**	**334,509**	**537**	**357**
***3Z1EYG**	**14**	**36,696**	**168**	**139**
			(Op: SP1EYG)	
***SP2HPD**	**7**	**346,574**	**444**	**298**
***SP6LV**	**1.8**	**6,312**	**54**	**48**

GREECE

SV/OK1YM	**7**	**926,772**	**795**	**413**
***SV1CID**	**A**	**32,625**	**143**	**125**
***SY1D**	**28**	**341,671**	**749**	**349**
			(Op: SV1DKL)	
***SV1DNW**	**14**	**52,155**	**203**	**171**

DODECANESE

J45KLN	**A**	**986,530**	**1305**	**470**
			(Op: SMØCMH)	
***SV5/DL3DRN**	**A**	**160,512**	**327**	**264**

CRETE

***SV9**				
/DL6MHW	**28**	**1,139,526**	**1578**	**531**

BOSNIA & HERZEGOVINA

T99W	**28**	**2,115,365**	**1863**	**665**
T94MZ	**21**	**1,960,155**	**1621**	**645**
***T92M**	**21**	**74,480**	**214**	**190**
***T98R**	**7**	**543,030**	**626**	**345**

EUROPEAN RUSSIA

RD4M	**A**	**4,017,600**	**2546**	**775**
			(Op: UA4LU)	
RM4W	**A**	**3,547,016**	**2085**	**748**
			(Op: RW4WR)	
RA4AG	**A**	**3,377,504**	**2320**	**736**
UF3CWR	"	2,643,766	1986	691
			(Op: RZ3AZ)	
UA3AGW	"	2,134,034	1565	626
UA6LJ	"	1,999,188	1725	642
UA1OMS	"	1,577,480	1423	565
RA3NN	"	1,501,745	1415	535
UA4LL	"	1,271,928	1203	536
RN1TN	"	1,106,280	1100	504
UA4WAN	"	1,000,840	1118	524
UX3ZW	"	905,280	972	492
RW3AFY	"	855,264	888	453
RW9TA	"	840,724	705	404
RZ1ZB	"	625,159	744	401
RA1TC	"	611,046	759	409
UR6IJ	"	322,200	555	300
RW3DA	"	185,196	329	253
RU4WF	"	116,256	225	173
RX3AEX	"	104,538	350	131
RV1CC	"	88,924	231	172
UA4CJJ	"	76,400	274	200
RA4PO	"	43,942	164	127
RX3DTN	"	43,776	159	128
UA4PI	"	33,579	154	123
UA6LP	"	10,382	69	58
RU6MM	**21**	**1,075,844**	**1079**	**539**
RW3GB	**21**	**1,050,510**	**992**	**485**
RI4C	**21**	**1,006,215**	**1065**	**555**
			(Op: RU4CO)	
RA6LW	"	999,719	983	527
UA6LAK	**14**	**449,036**	**604**	**406**
RX3AP	"	82,680	237	195
RA3VY	"	8,060	100	62
RZ4HF	**7**	**962,885**	**751**	**427**
RZ3AA	**7**	**882,824**	**800**	**422**
UA4PWW	"	772,200	665	390
RA3ANI	"	192,226	325	223
RA1ARJ	**3.5**	**113,094**	**274**	**183**
***UA4WA**	**A**	**1,412,577**	**1373**	**549**
***RU3FF**	**A**	**1,289,586**	**1279**	**538**
***RK3DH**	**A**	**1,247,424**	**1231**	**534**
*RA3AF	"	1,159,088	1168	524
*RW1QD	"	1,032,171	1128	483
*UA3IKO	"	927,290	1094	455
*RA3WA	"	903,849	1078	471
*UA1ANA	"	891,108	1111	446
*UA1AQF	"	844,515	1004	441
*RV4LC	"	757,560	929	428
*RV4LM	"	676,062	871	426
*RA3UAG	"	648,824	812	404
*UA4RF	"	625,278	789	394
*RA4CTR	"	563,202	745	402
*RW3AX	"	421,316	667	367
*UA4YJ	"	361,322	580	338
*UA4FER	"	339,480	529	328
*UA3QU	"	178,451	380	259
*RX3RB	"	147,490	367	215
*RU4WE	"	119,706	301	213
*RK1NA	"	106,926	284	213
*UA3XBB	"	105,754	278	209
*UA3AD	"	93,240	252	185
*RV3YR	"	71,857	255	181
*UA4FEN	"	14,196	86	78
*RN3AX	"	9,982	69	62
*RW3FO	"	9,585	83	71
***RA3AN**	**28**	**101,556**	**335**	**217**
***RA1ACJ**	**28**	**100,280**	**370**	**218**
*UA3LBE	"	378	22	21
***RN3OK**	**21**	**479,556**	**673**	**396**
***RX3ABN**	**21**	**162,554**	**320**	**238**
*UA3XAC	"	156,060	326	255
***RV6FZ**	**14**	**815,285**	**972**	**485**
***UA1ONG**	**14**	**303,281**	**514**	**349**
*RN1AO	"	186,592	500	272
*RU4WT	"	106,500	290	250
*RN4LP	"	1,271	33	31
***RK3BY**	**7**	**242,792**	**408**	**248**
*UA1TAN	"	172,420	333	233
***UA6ARD**	**3.5**	**106,920**	**266**	**180**
*RW3DY	"	97,614	260	174

KALININGRADSK

***UA2FZ**	**A**	**1,768,116**	**1692**	**588**

UKRAINE

UTØU	**A**	**4,621,807**	**2976**	**779**
			(Op: UT5UDX)	
UX7IA	**A**	**2,124,720**	**1844**	**624**
UV5QI	**A**	**1,946,755**	**1608**	**619**
US9QA	"	1,753,016	1471	607
UT4EK	"	1,684,308	1416	582
UV5U	"	1,526,856	1417	563
			(Op: UX1UA)	
UY4I	"	1,194,219	1249	519
			(Op: US3IZ)	
UT4PZ	"	928,972	1020	491
UX2RY	"	45,750	158	150
UT5JAP	"	25,979	101	83
UT5UGQ	"	2,911	44	41
UUØJX	**28**	**1,330,142**	**1418**	**587**
EM8I	"	551,650	861	425
UW5U	**21**	**1,334,942**	**1178**	**553**
UU2JZ	"	701,778	801	434
UU7J	**14**	**2,628,340**	**1836**	**715**
			(Op: UUØJM)	
UY3QW	**14**	**2,308,875**	**1671**	**655**
UT4NY	"	149,314	373	242
UT8LO	"	44,696	168	148
UW5Y	**7**	**1,028,592**	**827**	**432**
			(Op: US2YW)	
EO6F	**3.5**	**393,808**	**563**	**302**
			(Op: UXØFF)	
EO1I	**3.5**	**348,468**	**529**	**284**
UR6QA	**1.8**	**53,460**	**190**	**132**
UX5NQ	**1.8**	**45,952**	**191**	**359**
***UW7I**	**A**	**1,352,953**	**1462**	**557**
			(Op: UX9IO)	
***UZ2H**	**A**	**1,055,600**	**1192**	**520**
***UX3M**	**A**	**1,053,888**	**1199**	**528**
*UY5TE	"	784,665	1004	423
*UW7Q	"	703,902	905	402
*UT8IT	"	582,164	742	404
*UY5ZI	"	445,352	675	358
*UR5FCM	"	443,579	704	349
*UR5MID	"	393,228	520	331
*UY4F	"	295,500	563	300
*UX1IL	"	26,070	134	110
***UR4QOS**	**21**	**278,544**	**505**	**336**
***UTØRW**	**21**	**239,760**	**412**	**270**
*UR5FGN	"	23,474	126	97
***UR6QS**	**14**	**542,754**	**702**	**437**
***UY5WA**	**14**	**150,220**	**360**	**259**
*UR5TAU	"	147,936	393	268
*UY5YA	"	70,686	245	187
*UT3EK	"	50,382	171	162
*UT2FA	"	26,908	217	124
***UY1M**	**7**	**122,240**	**260**	**191**
***UT5PW**	**3.5**	**135,548**	**314**	**206**

*UT1FA	1.8	62,322	185	141	
*UT5ECZ	"	24,255	121	99	

LATVIA

YL2MR	A	1,651,898	1618	551	
YL2NN	A	450,889	689	361	
YL2IP	"	17,108	112	94	
YLØA	"	15,792	106	94	
YL3CW	21	2,339,766	1581	702	
*YL2GN	A	1,362,234	1342	534	
*YL2KA	A	1,082,848	1088	494	
*YL3FW	A	646,938	803	381	
*YL2LW	"	48,544	218	148	
*YL1ZZ	"	39,059	175	139	
					(Op: YL3GDJ)
*YL2UZ	28	110,418	332	231	
*YL2PM	3.5	148,000	310	200	
*YL3RW	3.5	137,200	310	200	

ROMANIA

YO8MI	A	257,250	494	294	
YO3FF	14	9,536	67	64	
YP3A	7	1,256,119	960	463	
					(Op: YO3KPA)
YO8BGD	3.5	2,574	33	33	
*YO6BHN	A	1,298,440	1204	520	
*YO2DFA	A	1,138,118	1235	478	
*YO3APJ	A	936,000	921	500	
*YO8FR	"	354,977	582	323	
*YO5BPF	"	352,800	575	336	
*YQØKAR	"	348,285	605	321	
					(Op: YO2KAR)
*YO8DHD	"	248,157	405	351	
*YO5DAS	"	168,268	417	236	
*YO4ZL	"	13,140	96	90	
*YO9FJW	28	362,654	645	358	
*YO5AJR	21	149,435	315	247	
*YO4RHK	"	560	14	10	
*YO4CTO	14	243,200	535	320	

YUGOSLAVIA

YU7BW	A	4,221,225	2364	771	
4N1N	28	259,560	512	309	
YU1KX	21	2,361,570	1525	669	
YZ9A	14	2,825,048	1888	724	
					(Op: YU1NW)
YT1BB	7	1,272,680	924	472	
YU1KR	3.5	311,952	488	268	
YTØA	1.8	76,616	233	157	
					(Op: YT7AO)
*YU7WJ	A	1,598,740	1411	559	
*4N7RGH	A	457,344	610	384	
*YZ1EZ	"	415,584	668	351	
*4N7A	"	379,344	639	336	
*YU7LS	"	318,153	472	341	
*YU1AAX	"	246,500	472	290	
*YU1PJ	"	108,488	268	191	
*YU1AU	28	655,196	816	466	
*YT1MP	28	520,205	718	445	
*4N1FG	"	489,392	710	419	
*YU7KM	"	151,887	365	257	
*YU7SF	"	138,006	312	246	
*YU1NR	"	57,090	210	165	
*YU1INO	"	14,000	99	80	
*YU7AZ	"	3,264	50	34	
*YT7TY	21	1,963,170	1494	661	
*YU1HFG	21	786,708	954	492	
*YU7FN	14	139,293	234	201	
*YZ1V	7	312,456	451	277	
*4N1A	3.5	213,905	397	239	
					(Op: YU1YV)
*YU1UA	1.8	59,015	203	145	

MACEDONIA

Z37FCA	A	21	3	3	
Z35M	3.5	1,400	28	25	
*Z32AF	A	1,320,575	1307	505	
*Z37A	21	2,641,175	1768	725	
					(Op: Z34A)

OCEANIA

THE PHILIPPINES

*DU1ODX	A	2,247,652	1397	506	
*DU7MHA	A	1,879,100	1338	460	

BELAU

T88SH	A	41,409	123	107	
					(Op: 7J1AIL)

SAIPAN

NHØE	A	1,235,202	1015	381	

HAWAII

NH7A	A	4,308,062	2136	649	
					(Op: KH6TO)
KH6ND	28	1,523,008	1226	424	

AUSTRALIA

VK5GN	A	240,352	378	203	
*VK4DX	A	258,930	360	210	
*VK4ICU	28	238,650	369	222	
*VK6HG	28	88,346	191	163	

INDONESIA

YBØZZ	A	3,508,395	1899	605	
					(Op: YBØECT)

NEW ZEALAND

ZL6QH	A	2,917,075	1641	553	
					(Op: ZL2BSJ)
*ZL1GO	A	114,400	225	176	

SOUTH AMERICA

CHILE

*XQ3ZW	A	3,568,000	1860	640	
*CE3WDD	14	105,544	225	167	

URUGUAY

*CX9AU	A	1,660,652	1050	467	

FRENCH GUIANA

FY5KE	A	9,625,620	3536	822	
					(Op: F6BEE)

ECUADOR

HC5EG	28	1,176	22	21	

COLOMBIA

*HK3PXA	14	20,736	86	81	

ARGENTINA

L99D	A	3,392,576	1731	632	
					(Op: LW9EUJ)
LU1DZ	A	2,006,690	1241	545	
LU5CW	28	5,531,399	2457	757	
LU6UO	28	1,960,782	1276	519	
LU5FA	14	1,602,536	1098	494	
*LU1EWL	A	1,235,788	886	454	
*LO7H	A	1,182,384	912	432	
*LW8EXF	"	91,504	210	152	
					(Op: LU7DW)
*LP1F	28	2,408,049	1431	567	
					(Op: LU5FC)
*LW1EXU	28	1,459,512	1056	466	
*LU1FC	21	1,368,389	975	473	
*LU6HS	"	151,920	252	211	

ARUBA

P49V	A	8,797,368	3440	804	
					(Op: AI6V)

BRAZIL

PY1KN	21	2,091,726	1289	545	
PY2NDX	7	3,005,954	993	518	
*PX2W	A	3,852,440	1889	685	
					(Op: PY2YU)
*PY1NX	A	2,134,860	1249	546	
*ZV7C	"	300,000	383	240	
*ZX2B	"	254,200	349	248	
					(Op: PY2MNL)
*PY2EL	"	155,827	262	197	
*PS7HF	"	150,336	240	216	
*ZW7C	"	80,478	263	102	
					(Op: PP7CI)
*PY7OJ	"	22,873	95	89	
*PY2GG	"	21,294	89	78	
*PY3FBI	"	13,020	74	62	
*ZX2XX	"	8,532	54	54	
*PY2AER	"	7,750	51	50	
*PU2NYV	28	387,990	485	270	
*ZV8O	28	256,022	376	229	
*PQ1S	"	22,800	100	76	
					(Op: PY1KS)
*PY7IQ	21	248,733	339	261	
*PR2W	21	136,040	260	179	
					(Op: PT2AW)
*ZW2Z	"	47,306	150	109	
*PY2APQ	7	7,956	40	39	

SURINAM

PZ5JR	A	7,827,358	3483	742	
					(Op: OHØXX)

VENEZUELA

YV4ABR	7	4,004	27	26	
*YV7QP	A	440,631	523	283	
*YV5NWG	"	1,365	23	21	

TRIBANDER/ SINGLE ELEMENT

UNITED STATES

NT1N	A	5,667,572	2650	794	
NB2Q	A	4,800,976	2256	764	
					(Op: N1EU)
NR1DX	"	3,897,702	1963	711	
K7ABC	A	3,588,264	2073	732	
					(Op: K6LL)
K7NV	"	2,960,958	1693	609	
KZ5D	A	2,530,107	1681	657	
N2ED	"	2,515,185	1553	601	
ND5S	"	2,188,914	1389	633	
K4BAI	A	2,164,428	1523	588	
NW6S	A	1,924,773	1277	587	
K8OQL	A	1,791,504	1236	572	
*WD5K	A	1,760,730	1330	570	
KW2J	"	1,735,128	1257	522	
KØCAT	A	1,569,155	1141	535	
					(Op: K9WIE)
*WK2G	A	1,525,443	1142	499	
W6TK	"	1,402,452	1099	489	
K1LU	"	1,354,420	1015	482	
*NX6T	A	1,264,572	1104	486	
					(Op: K6AM)
K2SX	"	891,756	796	414	
*N2CU	"	886,464	777	432	
*WN6K	"	838,530	933	385	
N2GC	"	720,295	667	355	
*N8LM	A	697,502	694	386	
*W2GG	"	630,329	630	371	
W7QN	"	502,152	652	366	
*NN1NN	A	331,188	472	286	
					(Op: N1DS)
*W6NKR	"	321,735	426	267	
*WA4IMC	A	321,186	451	269	
*W8VE	"	268,640	474	292	
*KQ1V	"	247,245	366	265	
WZ7ZR	"	217,165	495	257	
					(Op: W7ZR)
*WS7V	A	191,444	325	229	
W7WW	"	171,158	349	227	
*KØRY	A	161,240	281	232	
*N3NZ	A	150,336	279	192	
W2FUI	"	123,825	255	195	
K8MR	"	100,571	226	163	
*N6EM	"	97,252	217	164	
*AB1BX	"	96,976	229	176	
*NO5W	"	85,510	254	170	
*N4MM	"	55,878	152	134	
K6CTA	"	51,544	179	136	
*W3FQE	"	48,614	151	109	
N3UM	A	45,994	143	122	
*N5IW	"	35,880	167	120	
*NA7R	"	30,747	158	111	
*W4ATL	"	27,666	121	106	
*W8IQ	"	26,663	102	91	
*W6VNR	"	20,296	92	86	
*W8PN	"	8,400	62	60	
KE4OAR	"	4,141	44	41	
*WA1FCN	21	541,947	549	393	
*W6YJ	"	116,622	251	209	
W7AYY	21	2,552	30	29	
AC6DD	14	453,747	552	357	
*WR6WR	14	20,503	127	101	

DX

3V8BB	A	11,415,184	3930	821	
					(Op: YT1AD)
FY5KE	A	9,625,620	3536	822	
					(Op: F6BEE)
PZ5JR	A	7,827,358	3483	742	
					(Op: OHØXX)
VE2ZP	A	4,852,304	2348	692	
ZF1A	A	4,732,894	2529	713	
					(Op: W5ASP)
UN7LG	A	4,656,528	2212	648	
UTØU	A	4,621,807	2976	779	
					(Op: UT5UDX)
YU7BW	A	4,221,225	2364	771	
AN5FV	A	4,195,620	2660	780	
IK4MTF	A	3,861,097	2357	727	
*PX2W	A	3,852,440	1889	685	
					(Op: PY2YU)
*VE9DX	A	3,623,001	1714	717	
S5ØØU	A	3,381,126	2125	722	
					(Op: S53O)
HA8JV	A	3,356,598	2261	686	
*UP6P	A	3,145,629	1715	629	
					(Op: UN6P)
CT3KN	A	3,143,598	1700	537	
LY2OX	A	2,778,880	2039	668	
*IKØYVV	A	2,714,432	1949	664	
JA6GCE	A	2,574,988	1627	598	
OH6NJ	A	2,438,646	1826	651	
*DU1ODX	A	2,247,652	1397	506	
UA3AGW	A	2,134,034	1565	626	
*SN2A	A	2,111,100	1717	620	
S58WW	"	2,092,512	1718	614	
UA6LJ	"	1,999,188	1725	642	
S55A	"	1,871,253	1630	589	
G5LP	A	1,840,360	1614	556	
*LY2LA	A	1,831,950	1562	590	
*IØZUT	"	1,816,765	1591	587	
*UA2FZ	A	1,768,116	1692	588	
US9QA	"	1,753,016	1471	607	
DFØFS	A	1,691,637	1635	569	
					(Op: DL1EKC)
*OK1QM	A	1,662,536	1527	568	
*YU7WJ	A	1,598,740	1411	559	
*JH6OPP	A	1,538,012	1125	532	
UV5U	"	1,526,856	1417	563	
					(Op: UX1UA)
*RUØLL	A	1,506,291	1388	487	
*JA6ZLJ	"	1,503,990	1136	510	
OHØ/LY2CY	A	1,499,925	1586	525	
*S59KW	A	1,486,562	1482	539	
*F5JBR	A	1,481,799	1356	541	
*JH1AZO	"	1,412,990	1039	505	
EU1SA	A	1,390,275	1380	555	
OL4M	A	1,250,993	1293	499	
*LY2GV	"	1,234,800	1272	504	
*XX9TKW	A	1,231,254	1316	453	
					(Op: OH2KW)
*JF2QNM	"	1,223,125	998	475	
*5P1ER	A	1,167,360	1386	512	
					(Op: OZ1AA)
*JE1REU	"	1,113,915	935	473	
*IZØAIS	"	1,051,076	1184	493	
OK2HBR	A	1,037,136	1077	492	
UA4WAN	"	1,000,840	1118	524	
J45KLN	A	986,530	1305	470	
					(Op: SMØCMH)
*SP4TKR	"	984,227	1183	487	
*UA1ANA	A	891,108	1111	446	
*JE4MHL	"	888,731	816	421	
*PA3ELD	"	864,232	1037	472	
RW9TA	A	840,724	705	404	
G3ZRJ	"	822,206	949	418	
DL4HRM	"	813,722	902	442	
*7K4GUR	"	758,205	653	415	
OY1CT	A	731,178	1142	441	
*EA5FID	A	708,964	800	421	
*OK2HIJ	"	707,850	823	429	
*F5NQL	"	670,329	900	407	
*JP6GQN	"	669,762	597	471	
*JA2IU	"	666,159	608	377	
*JH5OXF	"	648,976	656	376	
RZ1ZB	"	625,159	744	401	
*DL2ZAV	A	588,000	848	400	
*OL5TEN	"	581,808	803	391	
					(Op: OK1JN)
EW2AA	"	567,742	778	379	
*JHØIXE	"	535,744	590	352	
OH4RH	"	507,375	736	375	
OK1AVY	"	475,500	662	375	
*LA3BO	A	464,202	800	369	
YL2NN	A	450,889	689	361	
*JJ3TBB	"	449,904	581	312	
*YV7QP	A	440,631	523	283	
*JR4PMX/1	"	437,574	513	313	
*CO8LY	A	435,420	557	295	
*JN3SAC	"	413,400	503	312	
I2SVA	"	408,090	564	366	
*JA1XRH	"	382,634	490	302	
*DF5ZV	"	376,532	552	338	
*JA2OJ	"	350,428	452	293	
*GI4SNC	A	336,539	700	367	
*OK2VWB	"	332,937	490	297	
HB9CIC	A	301,250	533	250	
*ZV7C	A	300,000	383	240	
*VK4DX	A	258,930	360	210	
*OH2VZ	A	237,987	431	279	
*RZ9AWO	A	230,769	394	231	
					(Op: UA9AM)
*JH2NWP	"	220,248	369	252	
*JQ2FFS	"	216,000	356	225	
*JG1OWV	"	202,086	319	206	
*IZ1ASP	"	200,940	283	197	
*OK2ON	"	190,816	400	268	
RW3DA	"	185,196	329	253	
*JJ1QJP	"	172,000	300	215	
G3UFY	"	171,351	349	237	
*IK4UNH	"	155,956	351	254	
*PY2EL	"	155,827	262	197	
*JS1PWV	"	153,846	303	198	
*JA1KI	"	130,743	259	199	
*UA3XBB	"	105,754	278	209	
JA6BGA	"	101,592	208	166	
*JE5XIC	"	98,154	244	171	
*EA7FZ	"	97,566	255	202	
*F5JOT	"	95,545	262	197	
*LW8EXF	A	91,504	210	152	
					(Op: LU7DW)
PA1BX	A	72,068	253	172	
JA2QVP	"	70,890	180	139	
*EA4CIE	"	67,643	212	173	
*OH6OS	"	62,328	207	168	
T88SH	"	41,409	123	107	
					(Op: 7J1AIL)
JA3DAY	"	33,681	111	109	
*TA3BN	A	23,940	101	84	
*JE8KKX	"	18,009	101	87	
*OK2BJ	"	15,768	90	73	
*AN1CBX	"	10,725	78	65	
UA6LP	"	10,382	69	58	
*JA9KUG	"	10,140	57	52	
*RW3FO	"	9,585	83	71	
*LZ4BU	A	9,540	66	60	
*PY2AER	"	7,750	51	50	
*JN1UEP/4	"	3,811	38	37	
*EA4ABP	"	2,944	64	46	
*OK2BHE	"	938	19	14	
*IZ3ALS	"	416	13	13	
OK1PG	28	199,178	431	287	
UA9LP	28	147,600	284	200	
*RA1ACJ	28	100,280	370	218	
*RWØLZ	28	91,043	329	181	
*VE3STT	28	19,197	88	81	
JR7RJZ	28	14,160	89	80	
*M7W	21	714,844	870	466	
					(Op: G4IIY)
*GW3NJW	21	609,771	830	439	
*VE3MQW	21	315,590	388	302	
*PAØMIR	21	300,468	464	343	
*PY7IQ	21	248,733	339	261	
*PAØRRS	"	191,187	365	291	
*JJ6TWQ	21	177,870	305	242	
*PR2W	"	136,040	260	179	
					(Op: PT2AW)
*JA3HC	21	114,723	227	189	
*JG3NKP/1	"	109,440	218	192	
*SP9ADV	21	83,848	215	188	
*PA1MRK	"	25,376	122	122	
G5G	14	1,879,471	1530	671	
					(Op: GØLII)
VE3KZ	14	1,845,337	1180	589	
OH3BU	14	1,151,876	1106	557	
JA9CWJ	14	539,936	550	359	
*CE3WDD	14	105,544	225	167	
*PA5F	14	50,904	201	168	
					(Op: PA4GF)
*ZS6MG	7	185,256	193	166	
*JE1SPY	1.8	90	10	9	

BAND RESTRICTED

*OH2CV	A	639,515	804	415	
*4N7RGH	A	457,344	610	384	
*UR5FCM	A	443,579	704	349	
OK1CRM	A	357,780	583	335	
*JR5EHB	A	210,693	346	237	

ROOKIE

CT3KN	A	3,143,598	1700	537	
DL3JK	A	2,492,708	1918	604	
9K9C	A	1,082,908	889	388	
					(Op: 9K2/OK1TYM)
*F8CRH	A	1,069,872	1132	496	
*SQ2HEB	A	513,240	721	364	
*KG4BIG	A	329,412	496	291	
*YU1AAX	A	246,500	472	290	
*K3DSP	A	115,432	275	188	
*ZL1GO	A	114,400	225	176	
*SQ4NR	"	26,700	108	89	
*RN3AX	A	9,982	69	62	
*IZ7CDB	A	1,830	31	30	
4N1N	28	259,560	512	309	
*F8CNR	28	31,232	163	128	
SI3SSA	21	1,294,850	1154	551	
					(Op: SM3WMV)
*AN7ASZ	14	494,500	677	430	
*SI9AM	14	243,110	505	302	
					(Op: SM3WMU)

ASSISTED

UNITED STATES

K5KG	A	3,783,624	1903	724	
W8AV	A	3,687,438	1851	706	
KW2O	"	3,526,908	1760	694	
					(Op: K2LE)
N8BJQ	"	2,719,167	1629	629	
WØTM	A	2,606,310	1586	630	
K9NR	A	2,150,874	1456	594	
KC1F	A	1,634,050	1121	550	
*K9YO	A	1,363,205	1125	515	
WF2B	"	1,270,583	975	487	
					(Op: K2ONP)
KD6WW	A	1,069,206	876	498	
*K2QMF	A	874,820	702	415	
K3KO	A	792,777	637	401	
K6III	"	753,376	755	416	
N5QQ	A	632,970	700	390	
K3SA	A	507,408	553	341	
K4IU	"	368,984	486	308	
*K9PG	"	266,124	331	331	
*K1KU	A	178,296	269	204	
K1TH	"	146,664	252	189	
K7GJ	A	101,748	219	183	
					(Op: K5RC)
W3UL	"	52,521	160	123	
*NC1N	"	25,248	107	96	
W2WB	21	1,140,048	866	522	

DX

IR2W	A	5,982,387	3081	823	
					(Op: I2VXJ)
JH3AIU	A	4,338,446	2182	719	
IQ2A	"	3,958,240	2543	715	
					(Op: I2UIY)
RX3APM	A	3,844,980	2485	738	
VA3RU	A	3,761,787	1934	669	
R3K	"	3,429,510	2353	735	
					(Op: RZ3FA)
RM3C	"	2,666,934	1933	687	
					(Op: RA3CW)
F5PHW	A	2,600,472	1862	673	

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EU5A	**A**	**2,571,814**	**1840**	**686**
			(Op: EU1FC)	
OH6NIO	**A**	**2,478,122**	**1866**	**643**
OK1FDY	**A**	**2,028,214**	**1582**	**599**
OM3IAG	**A**	**1,426,512**	**1284**	**526**
OH4JFN	"	1,335,725	1181	505
OE5OHO	**A**	**1,034,342**	**1001**	**463**
UT5UGR	**A**	**652,964**	**844**	**433**
***SV1BSX**	**A**	**606,225**	**845**	**411**
ZZ2Z	**A**	**516,750**	**545**	**318**
***UA1OAM**	**A**	**507,642**	**748**	**366**
***JH7IMX**	**A**	**489,402**	**594**	**318**
***F5YJ**	**A**	**422,712**	**615**	**342**
*JK1ATT	"	340,032	489	276
*JK2VOC	"	210,910	394	230
VE6LB	**A**	**206,228**	**331**	**218**
***S53AU**	**A**	**148,980**	**346**	**191**
OH2LU	"	123,525	312	225
OE1TKW	"	36,375	136	125
***PA3GRM**	**A**	**20,972**	**112**	**98**
*S57IIO	"	19,040	94	85
DL6KVA	**A**	**12,470**	**91**	**58**
***4N1SM**	**28**	**280,029**	**499**	**347**
DJ4KW	**28**	**51,294**	**200**	**166**
***DJ6TK**	**28**	**10,472**	**80**	**77**
OE3I	**21**	**1,467,804**	**1248**	**582**
			(Op: OE1JNB)	
IT9BLB	**21**	**1,005,077**	**1062**	**491**
PA3EWP	**21**	**959,740**	**936**	**470**
AM3AJW	**14**	**1,217,268**	**1212**	**578**
JK1GKG	**7**	**118,560**	**229**	**156**
JL6IPK	"	19,200	83	75
***YU1RA**	**1.8**	**54,530**	**201**	**133**

MULTI-OPERATOR SINGLE TRANSMITTER

UNITED STATES

WK6LA	**8,219,211**	**3389**	**833**
AB2E	**6,702,250**	**2791**	**830**
N4WW	**6,467,725**	**2896**	**811**
N3BB	**6,312,600**	**2847**	**835**
KW9DX	**4,781,969**	**2513**	**757**
NM5O	4,630,015	2418	815
W6YX	**4,627,470**	**2264**	**730**
K7RI	**3,869,712**	**2088**	**693**
NC7J	3,423,732	1957	663
K7AW	2,321,312	1509	602
NB3O	1,926,216	1300	558
N7WA	1,917,929	1366	559
KB1H	1,529,820	1121	540
KC4D	1,314,339	1015	503
N2DEM	**160,337**	**314**	**223**

NORTH AMERICA

6Y8A	**13,931,420**	**5145**	**922**
V25A	**11,853,855**	**4392**	**881**
VE7UF	**2,890,744**	**1624**	**604**
VE5RI	**2,285,595**	**1436**	**585**
VE6AO	**541,222**	**594**	**337**

ASIA

5B4AGD	**12,527,593**	**4390**	**871**
5B4/RS3A	12,267,072	4568	864
E41/OK1DTP	**10,071,096**	**3898**	**794**
OD5/OK1MU	**9,887,640**	**3793**	**790**
JJ3YBB	**4,799,736**	**2325**	**729**
JE4VVM	4,325,937	2209	671
JA1YNE	3,473,738	1857	683
JA1YPA	2,922,447	1594	649
HSØAC	**2,670,941**	**1971**	**599**
RW9C	**2,206,764**	**1270**	**567**
JE2YHS	1,936,632	1289	548
JA2YKA	1,394,404	1086	473
RZ9WXK	1,168,960	834	416
JU4Y	**994,568**	**1244**	**412**

EUROPE

9A7A	**9,091,620**	**4157**	**953**
RU1A	**7,666,218**	**3813**	**918**
IY4W	**7,543,426**	**3867**	**902**
AN6IB	**7,407,920**	**4126**	**884**
YL4U	**6,751,164**	**3407**	**898**
Z3ØM	**6,316,122**	**3846**	**851**
EN7Z	**6,296,476**	**3627**	**842**
OF3F	**6,293,708**	**3461**	**844**
RD3Q	6,059,313	3394	849
OH2U	6,045,108	3216	841
OL8M	**6,035,607**	**3165**	**837**
S5C	**5,605,432**	**3165**	**796**
RM6A	5,504,600	3150	850
OH7M	5,415,764	2936	851
OM2I	5,274,793	3055	839
TF3IRA	**5,020,407**	**3295**	**789**
OH9A	4,990,245	3034	785
DJ7TO	**4,823,196**	**2601**	**804**
OL5Q	4,469,328	2632	757
RI3A	4,274,208	2751	776
DF1LX	3,899,139	2511	723
II1R	3,482,700	2508	705
YL7C	3,340,995	2340	705
DLØDX	3,143,640	2194	680
EU5F	**3,123,900**	**2257**	**702**
F6KDF	**3,000,552**	**2280**	**654**
RZ4ZWR	2,613,424	2029	682
LZ9A	**2,349,213**	**1747**	**631**
LX9DIG	**2,283,792**	**1702**	**588**
PA3HBB	**1,996,710**	**1787**	**570**
DLØMZ	1,893,439	1623	599
SP3PFR	1,582,020	1461	561
F8KHZ	1,474,236	1309	558
ON5VL	**1,454,728**	**1417**	**542**
UX2FXX	1,330,830	1306	530
RK3RWL	1,329,816	1333	536
YO8KOS	**1,195,585**	**1355**	**491**
OM3KZA	1,130,670	1215	510
S57CQ	1,127,124	1160	524
RK3QWM	1,105,975	1048	533
F6KPH	863,958	1037	463
OK1KAO	778,227	900	447
8S2F	**545,200**	**783**	**400**
AN2RCA	325,325	513	325
AM7ALM	**206,974**	**491**	**239**
YU1AAT	**65,514**	**203**	**179**
OK6L	36,414	149	119
RU6LWT	21,203	100	91
LA1K	**15,916**	**107**	**92**

OCEANIA

4G1A	**3,091,299**	**1923**	**543**
4D1X	1,503,504	1182	424
4F1RWW	1,491,633	1090	429

SOUTH AMERICA

HC8N	**18,422,455**	**5390**	**985**
ZX5J	**11,456,088**	**3880**	**888**

MULTI-OPERATOR MULTI-TRANSMITTER

UNITED STATES

NR4M	**11,677,929**	**4299**	**1003**
NY4A	10,826,599	4240	931
W4MYA	9,857,622	3882	939
WY2000	5,534,904	2704	813
K1MK	**5,261,280**	**2462**	**776**
WR3L	**4,960,361**	**2401**	**791**
NJ4U	4,191,924	2323	726
K2XR	**1,832,220**	**1160**	**580**

NORTH AMERICA

WL7E	**15,833,953**	**5072**	**1037**

ASIA

JA3YBK	**2,187,920**	**1397**	**560**

EUROPE

4OØA	**20,932,902**	**8643**	**1143**
HG6Y	**13,711,011**	**6047**	**1041**
LY7A	**11,701,200**	**5672**	**995**
AN4ML	**11,330,266**	**6050**	**958**
ES5Q	**10,650,640**	**5226**	**988**
SKØX	**10,309,036**	**5156**	**982**
8S5X	9,006,462	4826	942
OL7W	**7,938,024**	**4219**	**904**
OZ5WQ	**3,588,340**	**2467**	**722**
DFØWA	**1,472,991**	**1361**	**537**

SOUTH AMERICA

PY3MHZ	1,620	20	20

CHECKLOGS

The following logs were used as checklogs. Checklogs and SWL logs are always appreciated.

3Z8HXN, 7SØW, 8M2ØØØ, 9K2/OK1TYM, AM5EU, CT1EGW, CT1FNT, DF3OL, DK3RED, DL3JON, DL3NM, DL3ZAI, DL4UJ, DL5CD, DL5DWW, DL5JRA, DL5NA, EA1VM, EA3DU, EA3DU, EA5OI, EA7VFW, HB9LDO, HG1R, HG1S, IV3/IK2AIT, JR6KDQ, K6FM, LA9GY, LU3DSI, LY1YC, LZ1FJ, LZ1JZ, LZ1XZ, LZ2VP, OK1DMP, OK1DSU, ON7SS, OZ6TL, OZ7AX, PAØUV, PA3AFF, PA3HGF, PA7XG, PT7YL, PY1ARS/4, RAØZN, RA3AD, RA3XP, RA4UAT, RA6LBS, RN2FA, RN3BK, RU3AA, RU3AA, RX9WN, RZ1AWJ, SMØBTS, SM2SCK, SM4HCF, SM6CDN, SM6DUA, SP1BLE, SP2-ØØØ1, SP2HMT, SP4DZT, SP4IGV, SP4TKO, SP5CPR, SP6CES, SP7FGA, SP7ICE, SP7XK, SV1JA, UAØZC, UAØZS, UA1AUW, UA1PBI, UA3TU, UA3YKG, UA9XEN, UA9XK, UN7FZ, UP6F, UT2XX, UUØJC, VA3TEE, W5AB, W8LYT, YA3YCX, YL2GTD, YO4ATW, YO6LV, YO8GF, YO9GZU, YV6AZC.

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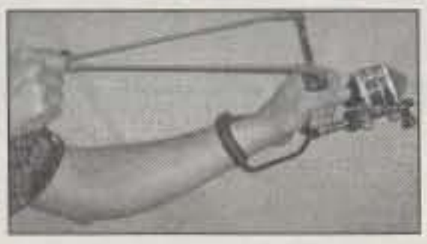

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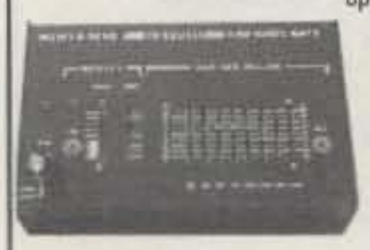

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NEW- the IQ-9000 Charger & Conditioner for AA & AAA batteries! $22.95
(1) Desktop unit can charge or condition up to 4 NiMH or NiCd cells!
(2) Has selectable conditioning feature !
(3) Provides safe, quick charge for cells!
(4) Automatic shut-off at end of charge!
(5) UL-listed power supply included!

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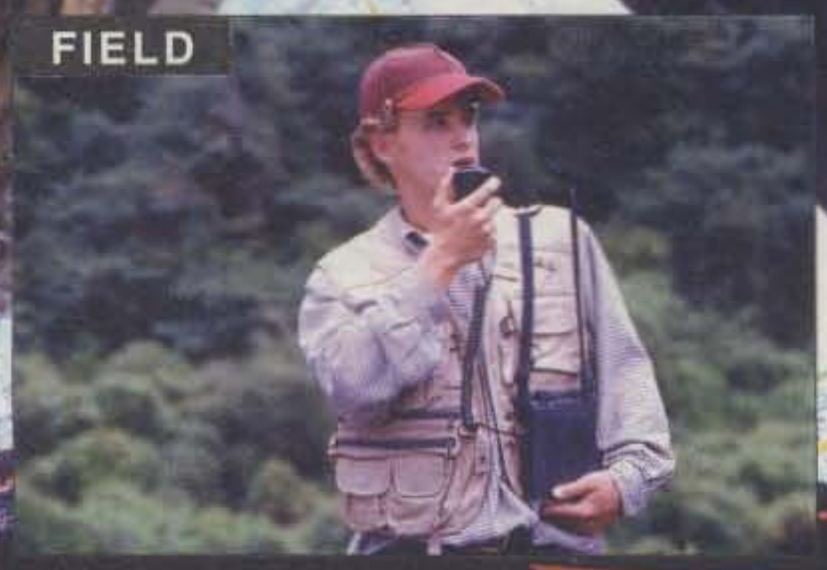
The Ultimate Backpacker!

Ham Radio in the Great Outdoors: It's the Best with Yaesu's FT-817!



Actual Size

Bring Ham Radio along on your next hiking, camping, or business trip with Yaesu's amazing new FT-817 Multimode HF/ VHF/ UHF Portable Transceiver!

- **ULTRA COMPACT:** Measuring just 5.3"x 1.5"x 6.5" WHD (135 x 38 x 165 mm) and weighing about 2 1/2 pounds (1.17 kg, including the supplied antenna and alkaline cells), the FT-817 is small and light enough to take along wherever you're going.
- **WIDE FREQUENCY COVERAGE:** 160-10 meters on HF, plus the 50, 144, and 430 MHz Amateur bands. Plus FM Broadcast, AM Aircraft, and Public Safety receiver coverage.
- **MULTIMODE DESIGN:** Ready for action on SSB, CW, AM, FM, FM-Wide (Rx), 1200/9600 bps Packet, and Digital, including dedicated USB and LSB PSK-31 configurations.
- **5 WATTS POWER OUTPUT:** Using a new-technology all-band MOS FET power amplifier, the FT-817 provides 5 Watts of power output when using a 13.8 Volt DC source. When using Alkaline batteries or the optional FNB-72 Ni-Cd Battery Pack, power is automatically set to 2.5 Watts; via Menu, this can be changed to 0.5 Watt, 1 Watt, or up to 5 Watts.
- **WIDE CHOICE OF POWER SOURCES:** The FT-817 is equipped with an alkaline "AA" cell battery case, and a 13.8 volt DC cable is also supplied. Available as an option is the FNB-72 Ni-Cd Battery Pack (9.6 V, 1000 mAh), which can be recharged using a 13.8 Volt power supply while the radio is being operated.
- **TWO ANTENNA PORTS:** A "BNC" connector is provided on the front panel, and a type "M" connector on the rear panel, with Menu selection of which connector will be assigned for operation on HF, 50 MHz, 144 MHz, and 430 MHz.
- **OPTIONAL COLLINS® MECHANICAL FILTERS:** An optional filter slot is provided, accommodating either the YF-122S (2.3 kHz) 10-pole SSB filter or the YF-122C(500 Hz) 7-pole CW filter. You get "base station" performance even from a mountain top.
- **INCREDIBLE MEMORY RESOURCES:** You get a total of 208 memories, including 200 "regular" memories which may be separated into ten groups of up to 20 channels each. And you can append an Alpha-Numeric "Tag" to each memory to aid in channel identification.
- **A CW OPERATOR'S DREAM MACHINE:** You get a built-in Electronic Keyer with adjustable weighting, adjustable CW Pitch, CW Normal/Reverse frequency tuning, and you can even use the microphone's UP and DOWN keys to send CW via the Keyer.
- **BUILT-IN CTCSS AND DCS:** The built-in CTCSS and DCS Encoder/Decoder systems provide you with the versatility you need for repeater access or selective calling.
- **DUAL - COLOR LIQUID CRYSTAL DISPLAY:** Select from Blue or Amber display illumination, which can also be switched off to conserve battery life. And while you're away, the Spectrum Scope will provide you with a visual record of activity ±5 channels from your current operating frequency.

See the exciting new FT-817 at your Yaesu Dealer's showroom today!

ALL MODE PORTABLE TRANSCEIVER

FT-817

HF/50/144/430 MHz Multimode Transceiver

YAESU
Choice of the World's top DX'ers

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Specifications subject to change without notice. Specifications guaranteed only within Amateur bands.Some accessories and/or options are standard in certain areas. Frequency coverage may vary in your country Check with your local Yaesu dealer for specific details.

Simultaneous Reception

VHF/VHF | UHF/UHF | VHF/UHF

A New Dual-Band Engineering Milestone:

Introducing the Dual Band Mobile for the 21st Century's Active Ham!

The Yaesu Engineering Team has done it again! The exciting new FT-7100M Dual Band Mobile brings you the ruggedness and operating ease of our single-band mobiles, and the convenience of remote-head mounting capability (optional YSK-7100 Separation Kit required), in an all-new 144/430 MHz Dual Band design!

Providing 50 Watts of power output on 2 meters, and 35 Watts on 70 cm, the FT-7100M has power to spare when you're in a fringe area. For repeater access or selective simplex calling, you get built-in encoder-decoder circuits providing 50 CTCSS tones and 104 DCS (Digital Code Squelch) codes. And the FT-7100M's huge 262-channel Memory System lets you store up to six Alpha-Numeric characters, for easy channel identification.

Operation of the FT-7100M is simple and straightforward, with separate Volume and Squelch controls for each band during dual-band reception, and eight single-function front panel keys provide the easy feature access you need during mobile operation. What's more, you also get three user-definable keys on the microphone to use for important control functions.

Rugged, reliable, and versatile, the FT-7100M provides the highest cost-performance available among Dual Band FM Mobiles. See your Yaesu Dealer today for a test drive!

144/430 MHz FM Dual Band Mobile Transceiver

FT-7100M

FEATURES

- Frequency Range: TX 144-148, 430-450 MHz RX 108-137 MHz (AM), 137-180 MHz, 320-480 MHz, 810-999.99 MHz (Cellular blocked)
- VHF/UHF, VHF/VHF, and UHF/UHF Dual Receive operation*
- Channel Steps: 5/10/12.5/15/20/25/50 kHz/step
- Power Output: 50 Watts (144 MHz) 35 Watts (430 MHz)
- Power Amplifier Type: 2SK3478 Power MOS FET
- Efficient Cooling System: Direct-flow heat-sink and thermostatically-controlled fan
- 262 Memory Channels: 120 "regular" memories, 5 pairs of band limit memories, and one "HOME" channel on each band
- Alpha-Numeric Memory Labels: 6 Characters on lower display field, 5 Characters on upper
- Smart Search™ Automatic Memory Loading System
- 50 CTCSS Encode/Decode Tones
- 104 DCS Encode/Decode Codes
- CTCSS and DCS Search
- ARTS™ (Auto-Range Transponder System)
- Automatic Repeater Shift (ARS)
- TMF Microphone (U.S. version): Includes 16-memory Auto-dialer, and Direct Frequency Entry
- Band Scanning, Band-Limit Scanning, and Memory Scanning
- Three Priority Channel Modes: VFO, Memory, and Home Channel Priority
- RF Squelch: Opens at user-defined signal level
- Tx Time-Out Timer (TOT)
- Automatic Power-Off (APO)
- 1200/9600 bps Packet Compatible
- Battery Voltage Meter
- Compact Size: 5.8" x 1.9" x 6.9" WHD
- Large (0.9" x 2.3") Liquid Crystal Display
- Cloning Capability: To other FT-7100M Transceivers
- Optional YSK-7100 Separation Kit
- Optional CT-39A Packet Cable

*Simultaneous reception on two different Frequencies, in-band or Cross-Band. Cross-band Repeater Function not available.

Actual Size

For the latest Yaesu news, visit us on the Internet:
http://www.vxstd.com

Specifications subject to change without notice. Some accessories and/or options may be standard in certain areas. Frequency coverage may differ in some countries. Check with your local Yaesu Dealer for specific details.

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HOT STUFF.

Surprisingly compact, yet packed with enough features to quench your need for any other handheld. Features like **a full 5 Watts** of power **on 50, 144, and 440 MHz**, plus an added **bonus band - 220 MHz** at 100mW! The **500 memory channels** are easy to remember with our **alphanumeric labeling**, and quick to find with ICOM's **new DMS technology** (Dynamic Memory Scan) - allowing you to pick and choose which memory channel to scan. The 'T82A also works as a **wide band receiver** - pick up your favorite TV shows or listen in on almost anything from police, fire, and military to shortwave and amateur bands. **DTCS and CTCSS** encode/decode make repeater access a breeze. Don't know the tone? The **tone scan function** will find it and give you the info you need. **Backlit keypad and display** is great for low light conditions. All this packed into a **JIS-4 weather resistant**, **die-cast aluminum case and chassis** that fits nicely into the palm of your hand.

Red hot!

[actual size - 2.5"W x 3.4"H x 1.15"D]

The New IC-T82A

Full 5W of Power on 50 MHz, 144 MHz & 440 MHz

Bonus Band - 220 MHz at 100mW • Wide Band Receiver - 495 kHz - 1319.995 MHz† • 500 Alphanumeric Memory Channels with New DMS Technology • DTCS/CTCSS encode/decode • Tone Scan • Backlit Keypad & Display • JIS-4 Weather Resistant • Split Operation • 1300mAh Li-ion Battery • Die-cast Aluminum Case & Chassis • PC Programmable*

This device has not been approved by the FCC. This device may not be sold or leased, or offered for sale or lease, until approval of the FCC has been obtained.

†Cellular frequencies blocked. *Optional software & cable required. ©2001 ICOM America, Inc. 2380 116th Ave NE, Bellevue, WA 425-454-8155. The ICOM logo is a registered trademark of ICOM, Inc. All specifications are subject to change without notice or obligation. T82ACQ201

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